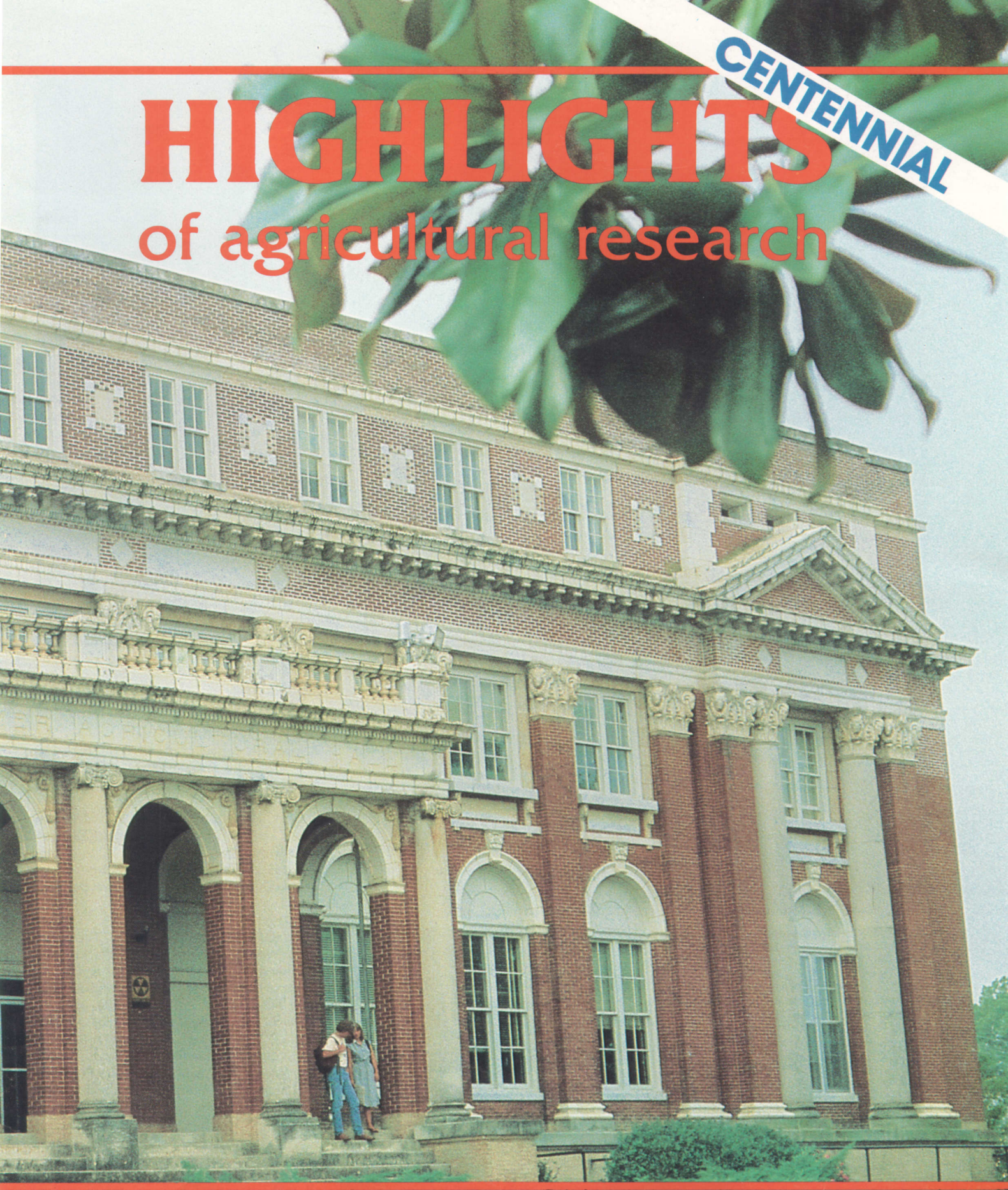
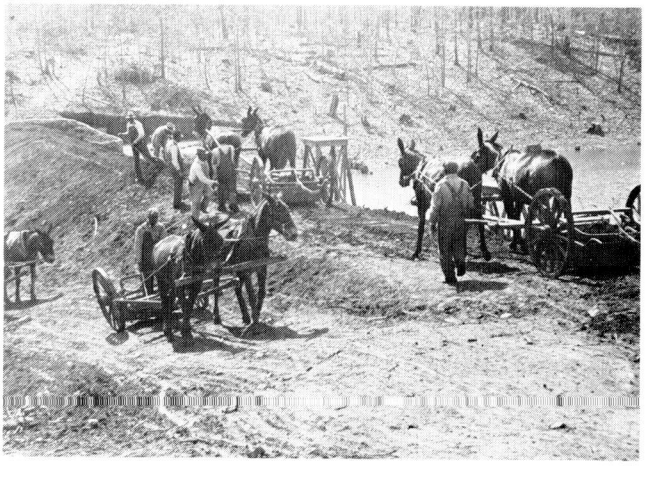
CENTENNIAL

HIGHLIGHTS
of agricultural research



Vol. 30 No. 1 Spring 1983
ALABAMA AGRICULTURAL EXPERIMENT STATION
AUBURN UNIVERSITY
GALE A. BUCHANAN, DIRECTOR
AUBURN UNIVERSITY, ALABAMA

These scenes from the past help tell the story of the Alabama Agricultural Experiment Station during earlier years. From top to bottom: Students help care for research orchards in this 1904 photo; cows outnumbered cars around Comer Hall in 1924; Experiment Station faculty poses for official photo in 1918; and the first fish ponds at Auburn were constructed in 1933, using mule teams and slip scrapes.



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Reflections of a Century of Service

On February 23, 1983, the Alabama Agricultural Experiment Station completes 100 years of service to the people of Alabama. This is an appropriate time to review our accomplishments, take stock of our current status, and consider the direction for the future.

From exceedingly humble beginnings that included only a couple of staff members and a few acres of land designated for research, the Alabama Agricultural Experiment Station has grown into a major center of research. It reaches into all parts of the State and touches the lives of all its citizens. Today, as we celebrate our 100th anniversary, the Alabama Agricultural Experiment Station employs over 200 agricultural scientists and almost 500 support personnel. They work on more than 300 research projects. Literally thousands of individual experiments are conducted annually in the search for answers to an assortment of problems that affect the farmers and citizens of this State. Experiments are conducted at the main research stations at Auburn and Shorter and at 21 other sites around the State on 21,000 acres.

The Alabama Agricultural Experiment Station was created by a state legislature that was concerned about the well-being of its people and the success of the State's primary industry, agriculture. The legislators, in their honest quest to provide a better life for the people of Alabama, exhibited great wisdom and far-reaching vision. During the intervening years, every legislator has had an opportunity to reaffirm that first commitment to the State's agricultural and forest industries by supporting the Alabama Agricultural Experiment Station.

From the beginning, the mission of the Alabama Agricultural Experiment Station has been clear: to conduct scientific research that will enhance the establishment and maintenance of a permanent and effective agricultural industry in the State. Over the years, we have refined, added to, and expanded our mission to include basic research, which affects all of agriculture and forestry. In more recent years, we have placed greater emphasis on protecting our soil and water resources and on improving the quality of our environment.

Because of the breadth of our research programs, no attempt will be made here to define the total impact of the Alabama Agricultural Experiment Station on the people of this State. Instead, this centennial issue of *Highlights of Agricultural Research* will document only a few of its accomplishments during the past 100 years.

Success of our research programs can be effectively measured by the knowledge that is generated. We live in a technological age where the quality of life, and even the survival of civilization as we know it, is dependent upon our accumulated knowledge. Although much of the research done by experiment station scientists finds immediate use in agricultural programs, there is a significant amount of research that contributes only to our pool of scientific knowledge. This knowledge pool provides the future basis for more efficient and more productive agricultural and forestry industries.

It is important that we maintain a healthy and well-supported research program for the well-being of the present generation and for generations yet to come. Our future accomplishments should match or exceed our past accomplishments, which have provided for a more successful agriculture and for a better life for all of us.

We are constantly reviewing our research programs. This often results in a redirection of resources into new research priorities. From the very beginning of the Experiment Station, we have utilized the collective wisdom of our scientists and administrators, along with input from the agricultural, forestry, and business communities, to chart the course of our research efforts.

The financial base of the Alabama Agricultural Experiment Station has always been somewhat tenuous. The fertilizer tax, which provided for the establishment of the Experiment Station, was never sufficient to fully support the desired research programs. The Federal Hatch Act of 1887 and direct State appropriations beginning in 1907 provided the first relatively sound and continuous financial support for the Experiment Station.

The State appropriation was $152,168 in 1936 and had reached one million dollars by 1958. For the past 5 years, the State appropriation has been between 7 and 8 million dollars per annum out of a 20-million-dollar annual budget.

Throughout the history of the Alabama Agricultural Experiment Station, there have not been sufficient funds to address all of the recognized research problems. With the increasing complexity of researchable problems and the high cost of conducting research, there is an even greater challenge to our scientists and support personnel.

The single greatest asset of the Alabama Agricultural Experiment Station is the scientists and support personnel who conduct the research that provides answers to problems affecting our agricultural and forestry industries. The record of accomplishments is, indeed, a tribute to the dedication and perseverance of these individuals to their research programs.

The challenge for the future is quite simple: provide the knowledge that will make possible a better life for the citizens of this State and Nation. This requires the dedication and intellect of the imaginative and hard-working men and women who make up the Alabama Agricultural Experiment Station. We have effectively met the challenges of the past 100 years, and I am convinced that we will be equally successful in the years ahead.

Gale A. Buchanan
Dean and Director
February 23, 1983

Development of the Alabama Agricultural Experiment Station During Its First 100 Years 1883-1983

Taking records in the "Old Rotation" plot in 1923. Established in 1896 to test advantages of rotating cotton and legumes, the "Old Rotation" is still active on the same plots.

"The Trustees shall establish and maintain an agricultural farm or station, where careful experiments shall be made in scientific agriculture. . . ."

With those simple words signed into State law in February 1883, the Alabama Agricultural Experiment Station was created by the administrators of the State's land-grant college at Auburn. A century later, the Experiment Station still conducts "careful experiments"—but on a variety of topics related to an agriculture more changed than the framers of the act probably could have imagined. Over these 100 years, the Alabama Agricultural Experiment Station has changed as our agricultural and forest industries have changed, to fulfill the demands of its research mission.

The 1882-83 session of the Legislature passed the act which included a call for an experiment station at the insistence of Alabama farmers who needed protection from unscrupulous commercial fertilizer dealers. Thus, the Hawkins' Bill, as the act was known, provided for the inspection and certification of fertilizers sold within the State. Alabama's land-grant college at Auburn was given the task of performing analyses of fertilizer samples, receiving in return one-third of the proceeds collected from a fee charged to the fertilizer sellers. The majority of the funds provided to the college was spent in performing the fertilizer anlayses, but some money was left to provide land for the Agricultural Experiment Station at Auburn.

A small demonstration farm had been operated as a teaching laboratory for agricultural classes since the Agricultural & Mechanical College of Alabama was established in 1872 as the State's land-grant college. With money advanced by the State in 1883, the College's trustees purchased another 226 acres for farm research plots and employed a Virginia-educated scientist, James S. Newman, as the Experiment Station's first director and the College's second professor of agriculture.

Director Newman began investigations on Station farm plots devoted to cotton, oats, wheat, sweet potatoes, and a variety of fruits and vegetables—all with the help of a staff that included only a chemist, W.C. Stubbs, and his two laboratory assistants. At the time, Newman also was directing experiments on the Canebrake Experiment Station, near Uniontown, after its creation in 1885 by a Legislature determined to aid the State's most important farming region, the Black Belt.

James S. Newman

Beginning in 1887, when the U.S. Congress passed the Hatch Act to provide $15,000 annually to each state for an agricultural research station, the Auburn

"Farmers generally cannot afford either the time or money to conduct experiments with such accuracy and persistency as to render the results valuable. Hence, the necessity for an agricultural experiment station where such investigations are conducted for the general good under the auspices of the State."—James S. Newman, 1883

Station was able to expand its program of experiments for Alabama farmers. In the next year, Director Newman enlisted the aid of cooperating farmers in a program of testing different mixes of fertilizers and cotton cultivation practices on the variety of soils found across the State. In 1893, the cooperative arrangement was extended to corn growers and, in 1901, to farmers with pasturelands.

The federal money also allowed the Station to add to its scientific staff.. P.H. Mell, who had been a professor of natural history and of modern languages at the College since 1878, was employed in 1888 as the Station botanist. Mell subsequently was to serve as the Experiment Station's second director, from 1898 to 1902. An outstanding biologist was found in G.F. Atkinson who, though only with the Station from 1889 to 1892, earned notoriety for his discovery that cotton "rust" stemmed from a lack of potash.

In 1892, C.A. Cary joined the College and Station as a veterinarian and also served the Station as a dairy and meat inspector. Dr. Cary also administered the Experiment Station-sponsored farmer meetings that were forerunners of the Alabama Cooperative Extension Service.

During A.J. Bondurant's career as agriculturist between 1892 and 1895, he advocated the substitution of tobacco culture for cotton, but with little success. More practical was the work of his successor, John F. Duggar, who established a plot to test and demonstrate the advantages of rotating cotton with nitrogen-restoring legume crops—a project known as the "old rotation," which has been carried on continuously on the same plots since 1896. A horticulturist and an entomologist also joined the Experiment Station staff in 1896.

Comer Hall under construction in 1907. It burned in 1920, but was rebuilt and still presides over Ag Hill.

"Letters have reached the Director's office during the last year asking for information on topics relating to orchards, the lands and fertilizers suitable for the successful cultivation of corn, cotton, grass, and other forage plants, how to save hay, and the best plants adapted to making pastures; how to feed for beef and milk and butter, the best breeds of stock for this climate and how to take care of the fine grades of stock."—Patrick H. Mell, 1901

"After America entered the war heads of departments of the Experiment Station were requested to give preference to those projects having an immediate bearing on the increase of the nation's food supplies. An examination of the projects then in hand showed that so many of them already had this direct application to food production problems that relatively little change in the entire plan of work was made necessary by the national emergency."—John F. Duggar, 1919

1900-1950

A host of new concerns was added to the Alabama Agricultural Experiment Station agenda in the first half of the 20th century. With increased funding and a larger, more specialized corps of scientists, the Experiment Station was able to address new farm problems as they arose. The boll weevil invasion of the 1910's prompted a search for insect control methods and for crop alternatives to cotton; the persistent economic depression of the 1920's and 1930's called for more intensive marketing research; and the special demands of war in the 1940's directed increased attention to labor-saving farm mechanization.

J.F. Duggar served as Station director from 1903 to 1921. He was able to enlarge agricultural investigations when legislation passed in 1906 tripled the Station's annual federal appropriation. Further financial help came in 1907 when the State replaced the cumbersome fertilizer tax with direct appropriations. The Alabama Legislature also funded the construction of Comer Agricultural Hall in 1907 and paid for its rebuilding after it was razed by fire in 1920. Comer Hall still presides over Ag Hill, from its lofty perch on the highest ground on the agricultural campus.

John F. Duggar

As funding increased and new staff members were added, subject-matter departments evolved to coordinate the increasingly complex research program. Horticulture gained departmental status in 1903 with R.S. Mackintosh as head; Entomology was given the same distinction in 1906 under F.S. Earle. Crops and Soils was organized as a department in 1919 and became the Department of Agronomy in 1931. Dan T. Gray began his career at Auburn in 1905, served as the first head of Animal Industry when that department was created in 1907, and subsequently filled the Station director's post from 1921 to 1924. Gray also became the first director to serve concurrently as dean of the School of Agriculture.

Botany, with F.E. Lloyd as head, became a Station department in 1908. Agricultural Engineering followed in 1916, soon gaining national attention with the development of the widely adopted, erosion controlling

The "Nichols Terrace" design permitted tractor operation in terraced fields (top). Cabbage production research was begun at the Gulf Coast Substation in 1929 (right).

"Nichols" terrace design named for M.L. Nichols, an early head of that department.

Marion J. Funchess, who came to Auburn as an agronomist in 1909, served as director of the Alabama Station from 1924 to 1951. Under his 27 years of leadership, the Station weathered an economic depression that threatened to bankrupt the Station, followed by a world war that briefly drained it of its scientists. Yet, it emerged as a stronger institution, better able to provide useful information to Alabama's agricultural sector which was beginning a fundamental transition away from its traditional dependence on cotton.

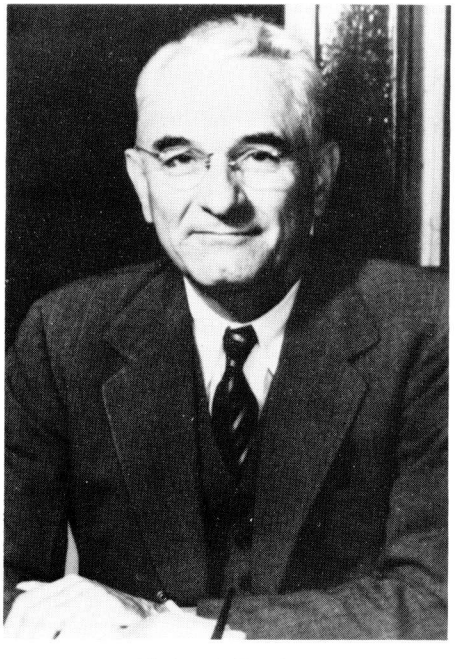
While the U.S. Congress legislated increased funding to the experiment stations on three occasions during his tenure, more important to Funchess was the realization of a dream held by each of his predecessors—the creation of an outlying unit system. Confronted by a long-standing agricultural depression, the Alabama Legislature moved to link research more directly to location conditions. In 1927, research substations were established to conduct experiments on five major Alabama soil regions and experiment fields were founded for 10 important but less extensive soil regions. Between 1943 and 1948, five additional substations followed, two of which were devoted specifically to horticultural crops, and in 1946 a plant breeding unit was established.

As Funchess had envisioned, cooperative research on outlying units has played an important role in the Experiment Station's research program and made major contributions to agriculture and forestry in Alabama. In addition to affording the obvious advantages of attacking and solving problems of the area where the unit is located, outlying units that blanket the State serve as windows through which Alabamians can see firsthand research being done to solve specific agricultural and forestry problems.

As economic hard times prompted farmers to look for alternatives to cotton, the Experiment Station broadened its research concerns. Forestry research at the Station began in the 1920's, expanded to include

"It may be perfectly proper for some kinds of institutions to have certain subjects studied for the sake of truth and truth only. It is necessary, however, for those associated with experiment stations, particularly those who work in the South, to bear in mind that the great bulk of their studies must have a final practical application to industry."—Dan T. Gray, 1923

Dan T. Gray



Marion J. Funchess

four forestry units across the State in the early 1940's, and separated from the department of Horticulture in 1947. R.H. Westveld was the department's first head.

Poultry also achieved departmental status in 1947 with D.F. King as head, as the broiler industry began extraordinary growth in Alabama after World War II. Research in poultry had begun as early as the 1920's under the department of Animal Husbandry.

Fisheries investigations were revived in the 1930's (the Station's first bulletin in 1883 was on raising carp) by H.S. Swingle, who had come to Auburn as an entomologist. From its beginning as a program to improve sport fishing, Auburn fisheries research achieved such stature that in 1970 it gained departmental status and was expanded to include the International Center for Aquaculture, a unit that now enjoys world renown.

New departments also emerged to carry out research supplemental to production agriculture. Home Economics began in the 1920's with human nutrition investigations, was expanded to include textiles research, and became a department within the Experiment Station in 1950.

Nationally, as farm prices seemed to decrease proportionate to productivity increases, farm management and marketing research gained emphasis, stimulated in part by federal legislation. At the Alabama Station, a department of Agricultural Economics was established in 1928 with J.D. Pope as head.

The dissemination of research results was legislatively mandated when the Agricultural Experiment Station was founded. By 1947, the task of making research information available had assumed such proportions that a department of Publications was formed with K.B. Roy, Station editor, named department head.

"It is reasonably safe to state that the Alabama farm income may be doubled by the development of farm programs that greatly increase yields of crops and the development of feed, forage, and pasture systems. It should be clearly understood, however, that such a program will call for the most intensive and extensive educational activity ever undertaken."—Marion J. Funchess, 1944

Top: This poultry farm on the southern edge of the campus served poultry research until new facilities were provided in the 1970's. Bottom: Organized forestry research began in 1927 with pine plantings on this eroded field at Auburn.

TABLE 1. THE ALABAMA AGRICULTURAL EXPERIMENT STATION SYSTEM

Name	Location	Date authorized or acquired	Acreage	
			Original	Present
Main Station	Auburn	1883	226	4,609
E.V. Smith Research Center	Shorter	1973	3,226	3,149
Substations				
Tennessee Valley	Belle Mina	1927	240	760
Sand Mountain	Crossville	1927	240	536
Black Belt	Marion Junction	1927	1,116	1,116
Wiregrass	Headland	1927	220	532
Gulf Coast	Fairhope	1927	720	800
Upper Coastal Plain	Winfield	1944	735	735
Piedmont	Camp Hill	1945	1,409	1,409
Lower Coastal Plain	Camden	1947	1,790	2,707
North Alabama Horticulture	Cullman	1948	160	159
Chilton Area Horticulture	Clanton	1948	145	161
Experiment Fields				
Prattville	Prattville	1927	40	80
Monroeville	Monroeville	1927	40	79
Brewton	Brewton	1927	60	80
The Canebrake Substation at Uniontown has been discontinued as have experiment fields at Alexandria, Aliceville, Atmore, Gastonburg, Hackleburg, LaFayette, and Tuskegee.				
Forestry Units				
Autauga County	Prattville		300	300
Barbour County	Clayton		180	180
Coosa County	Alexander City		160	160
Fayette County	Fayette		1,332	1,332
Others				
Plant Breeding Unit	Tallassee	1946	640	644
Ornamental Horticulture Field Station	Mobile	1951	7	22
Turnipseed-Ikenberry Place	Union Springs	1976	1,028	1,028
Solon Dixon Forestry Education Center	Covington and Escambia Counties	1979	80	394

THIS PAGE: Left—the new 3,200-acre main station, near Milstead, was developed during the tenure of Director R. Dennis Rouse (left) and named in honor of Director E.V. Smith (right); below—Ornamental Horticulture Field Station, Mobile, was established in 1951; Turnipseed-Ikenberry Place, donated in 1976, provided a place for pecan research. OPPOSITE PAGE: Funchess Hall (top) was dedicated in 1961, new poultry facilities were added in the 1970's (left center), and the Solon Dixon Forestry Education Center was donated in 1979 (right center).

1951-1983

In the past three decades, Alabama agriculture has changed greatly. Farming has become more diversified and business oriented as cotton acreage has given way to a variety of other crop and livestock enterprises, and farm numbers have decreased as individual farm size increased. The Alabama Agricultural Experiment Station has changed a great deal too, to provide the knowledge necessary for farmers and consumers to adapt to their rapidly changing world.

Edwin V. Smith became Experiment Station director in 1951, the first Auburn graduate (B.S. 1929) to hold that position. Smith was assistant and then associate dean and director under Dean Funchess from 1944 until he took up the post he was to hold for 21 years. Under Smith, the Station staff became larger and more specialized as beef cattle, poultry, and wildlife conservation became topics of increased research interest.

The Station's office and research facilities grew as well. Dedicated in 1961 were new buildings for the biological sciences (Funchess Hall) and animal sciences (Livestock Arena, Lambert Meats Laboratory, and an addition to the Animal Sciences Building), as well as two buildings for cooperating researchers from Auburn's School of Veterinary Medicine (McAdory Hall and the R.S. Sugg Lab).

The outlying research system added an ornamental horticulture field station in 1951. A foundation seed stocks farm followed in 1953. In that same year, a Soil Testing Laboratory was established at Auburn, which analyzes thousands of soil samples annually and makes fertilizer recommendations for many different crops.

To serve the need of Station scientists for rapid analysis of research, a Department of Research Data Analysis was formed in 1957. Individual researchers were thus freed by statisticians from hours of time-consuming calculations.

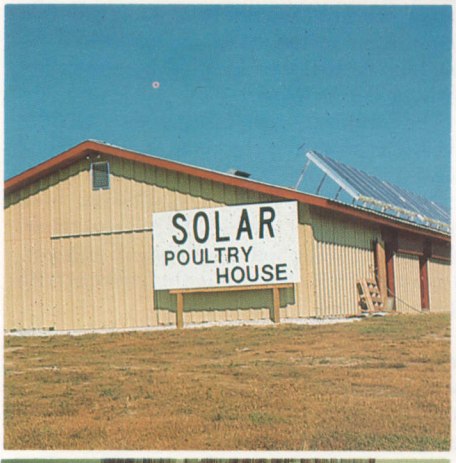
Although investigations into production and marketing of farm commodities continued to dominate the Station's program in the post-World War II period, "people oriented" research grew in importance. An originally short-lived cooperative wildlife research unit of the 1930's was revived in the 1950's by the Zoology-Entomology Department to study wildlife conservation. In the 1950's, Station agricultural economists began to consider the problems that agricultural transformation was causing rural communities. Rural Sociology was appended to the title of Agricultural Economics in 1965, a recognition of that field's growing importance.

R. Dennis Rouse, who had joined the Station in 1949 and served as associate director under E.V. Smith since 1966, became the Station director and School of Agriculture dean in 1972. During his 8 years as its leader, the Experiment Station built and remodeled facilities to upgrade Alabama's agricultural research system.

The cornerstone of the modernization program was the purchase and development of a 3,200-acre tract where field plots for agronomic and horticultural research and the bulk of beef and dairy cattle field work

"As surely as new hazards will appear, agricultural scientists will initiate research aimed at their removal. It is only through the constant vigilance of agricultural science and the application of scientific information by farmers that America maintains its well-fed status."—Edwin V. Smith, 1970

"The Alabama Agricultural Experiment Station is planning a research program not only directed toward solving problems of production, marketing, and processing products of farm and forest for consumers, but also providing research information that is needed for sound rural development and land use planning that will ensure the continued productivity of an abundance of agricultural products and at the same time provide guides for better living in rural as well as urban Alabama."—R. Dennis Rouse, 1973



Gale A. Buchanan

"We at Auburn are alert to needs for new programs that address future problems in agriculture and forestry, as well as general societal concerns. While needs can be identified by special interest groups, the Agricultural Experiment Station must make the hard decisions that finally determine which needs are addressed in research."—Gale A. Buchanan, 1981

were relocated. Construction of this complex, named in honor of E.V. Smith and located near Milstead between Auburn and Montgomery, began in 1975 and its dedication followed 3 years later.

The completion of the Center allowed the Auburn Main Station to renovate its physical plant. New or vastly remodeled facilities were provided for poultry, swine, fisheries, and forestry research and a modern seed technology center was completed with the cooperation of the Alabama Crop Improvement Association.

Land donations during Director Rouse's tenure added two new units for outlying units. The Turnipseed-Ikenberry Place near Union Springs, acquired in 1976, furnished an ideal site for pecan production experiments. Near Andalusia, the Solon Dixon Forestry Education Center was constructed in 1979 to furnish a place not only for research but for teaching and extension as well.

By the early 1980's, the Alabama Agricultural Experiment Station System included 22 separate units totaling some 21,000 acres across the State, in addition to on-campus facilities. In 1974, a department of Research Operations, headed by V.L. Brown, was created to coordinate the construction, maintenance, and production and storage of crops for the research complex.

Auburn University's land-grant agricultural service program, which includes teaching and extension as well as research, had become so complex by 1980 that a new University president undertook a significant reorganization. A Vice President for Agriculture, Home Economics, and Veterinary Medicine was named to oversee the teaching, extension, and research programs of these three schools. Stanley P. Wilson, the Station's associate director from 1975 to 1980, was selected for the new post.

For the first time in almost 60 years, the position of dean of the School of Agriculture was separated from that of director of the Experiment Station. Dean Rouse continued as dean of the renamed School of Agriculture, Forestry, and Biological Sciences, and Gale A. Buchanan, an Auburn staff member since 1965, became the dean and director of the Alabama Agricultural Experiment Station in 1980.

In the 1980's, Alabama farmers, like those in the rest of the Nation, have faced the grave problems of consistently low market prices, high interest rates, and escalating production input costs. Cost-efficiency has thus become extremely important in agriculture, and the Experiment Station under Director Buchanan has directed much of its research toward finding ways to lessen the severity of the persistent cost-price squeeze. Multi-cropping studies seek to make the most efficient use of land, labor, and equipment, while reduced tillage investigations hold promise for soil and energy conservation. As proper timing of fertilizer and pesticide applications has become more important for economic as well as environmental reasons, research into these areas has increased. Feed-efficient methods of producing livestock, poultry, and fish have also become of greater concern to Station scientists.

Among the new administration's first concerns was the more complete integration of extension specialists with their teaching and research counterparts. Efforts toward such integration had begun in the 1970's, and thus became a priority in the early 1980's as Auburn University sought to make its agricultural service program more efficient. Economic recession in the 1980's has so far complicated efforts toward personnel integration, as well as hindering the completion of facilities begun in the mid-1970's and even the continuation of some research.

As the first century of the Alabama Agricultural Experiment Station closes, the organization is engaged in a search for the most efficient way to use its funds—much as it had been when it was formally established in 1883. The story of the Station's performance in the face of today's challenge belongs not to the past, but to the future.

—Norwood Kerr

Research: Past, Present, Future

INNOVATIVE...

That single word adequately describes work of the Alabama Agricultural Experiment Station throughout each period of its 100-year history. This was true in 1883 when the two-man professional staff undertook to solve some of the problems that limited productivity of crops and livestock in that era of "crude" agriculture. The same description can be used today for research by Auburn's 200 agricultural research scientists and their support personnel who are providing the technical data demanded by today's space-age agriculture.

No term less than innovative could describe the 1889-92 work of George F. Atkinson, who established basic plant-nematode associations that are still cited nearly 100 years later.

In the basic field of nutrition, pioneering work of W.D. Salmon drew international attention to Auburn by his pioneering studies that established the biochemical connection between certain nutritional elements and development of cancer and other disorders.

An entomology researcher sounded the boll weevil alarm several years before the pest arrived, and research was begun that helped cope with the weevil when it arrived. Researchers with a vision of the Black Belt area's potential helped pave the way for a livestock industry that was better suited than cotton for that area.

Fish farming is a viable industry and pond fishing for sport is a pastime for millions because of Auburn's pioneering fisheries research program that began 50 years ago. And millions around the world are better fed because H.S. Swingle chose to share his expertise in fish production with the world.

When pioneering Auburn soil scientists identified nutrient and lime deficiencies of Alabama soils and determined fertilizer ratios and lime rates needed, they were paving the way for a profitable Alabama agriculture. This same kind of innovative work later resulted in Auburn's Soil Test Laboratory gaining national recognition for its service that provides "prescription" fertilizer and liming recommendations based on widespread field testing on all soils of the State.

The Auburn researcher who planted pines to test their value in erosion control 56 years ago was taking only a small step at the time. But today, that beginning has led to a forest industry that is a major part of Alabama's economy.

Release of the first snap bean with nematode resistance, in 1938, represented an early contribution of Auburn's plant breeding program. A forward-looking forage breeding program since World War II has made available many superior crops for Alabama livestock farms. Other Auburn releases have contributed to the beauty and conservation of roadways, public areas, and home grounds.

Alabama's multi-million dollar poultry industry could never have reached its potential without the forward-looking Auburn research that conquered coccidiosis and cholera and provided the know-how for light control and cage house operation.

Crop production was totally changed by Auburn agricultural engineers and weed control researchers, who relegated the hoe, pick sack, peanut stake, and pitchfork to agricultural museums. Who but an innovative scientist would have believed that peanuts or cotton could be harvested by machine or that weeds could be controlled without hoe or plow?

The Auburn breakthrough that enables livestock producers to recover and refeed wasted nutrients from manure represents innovation at its best. Agriculturists from around the world traveled to Auburn to see beef cattle being fed "wastelage," and current research is continuing this concept with other livestock.

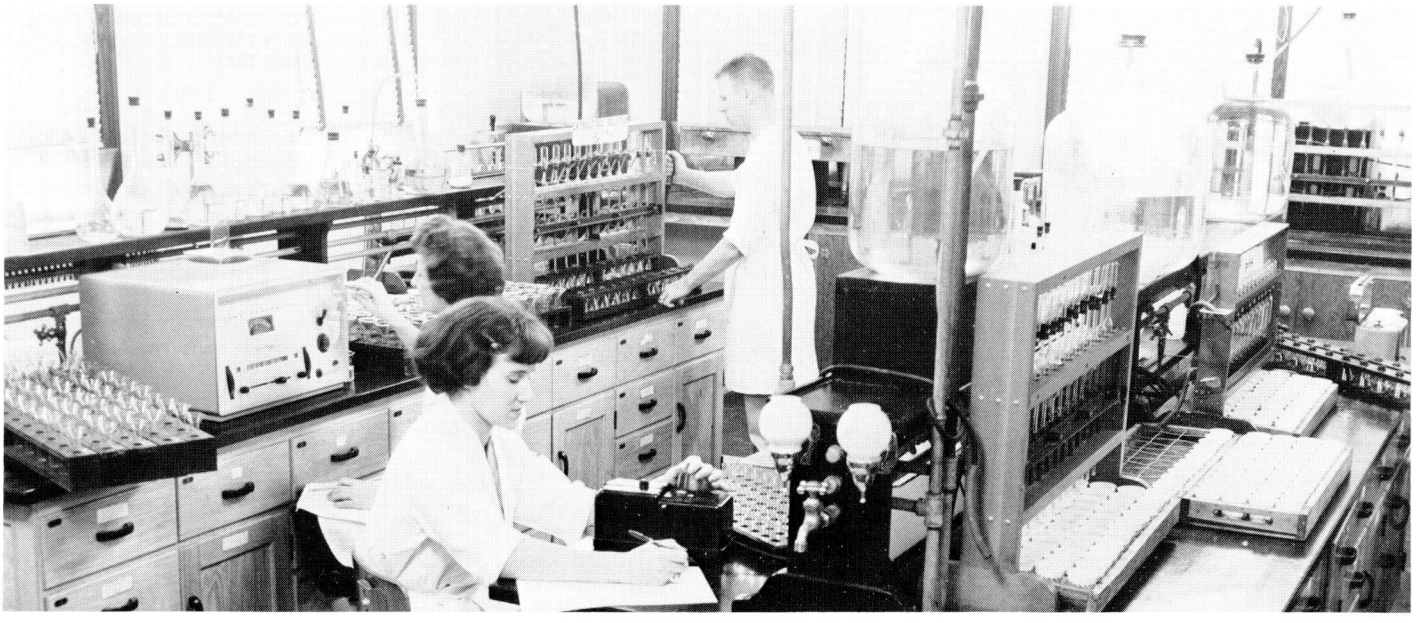
And new ideas keep coming. A team of researchers appears on the verge of doubling beef gain on tall fescue by eliminating the problem they identified—a fungus in the grass that inhibits animal performance. Another is learning to regulate sows' breeding cycle to group farrowings for greater efficiency. Still another is solving the riddle of bad egg shells that waste millions of dollars annually. The list goes on and on, as evidenced by the reviews for each department that follow:

AGRONOMY AND SOILS

Research dealing with crop production goes back to the very beginning of the Alabama Agricultural Experiment Station, when the director and a chemist comprised the entire professional staff. A formal agronomic research program was activated by an act of the 1911 Alabama Legislature that provided funds for cooperative field experiments with farmers. J.T. Williamson was hired that year to conduct fertilizer experiments across the State, which resulted in much valuable information being supplied to Alabama farmers.

The Department of Crops and Soils was created in 1919. The current name, Department of Agronomy and Soils, was adopted in 1931. During the early years of the Department, emphasis was on soils and fertilizers. Since 1940, the crop research program, including plant breeding, crop production, weed control, and turf management, has been greatly strengthened.

Weed science research, begun in the late 1940's, has provided the scientific know-how for a technical revolution in crop weed control.



Auburn's soil testing lab, shown here in its first location, has developed a reputation as one of the best in the Nation.

One of the Department's strongest areas of expertise and influence has been in soils research. Auburn has been blessed with a long succession of capable soil scientists, many of whom moved on to leadership positions in other areas. Research projects were traditionally divided on the elemental basis, conducted by specialists in nitrogen, phosphorus, potassium, micronutrients, and lime. Other researchers concentrated on field research, soil test calibration, and fertilizer recommendations. Continuous effort has been made to maintain current applied research supported by basic studies on which to base recommendations to Alabama farmers as agricultural practices have changed and yields have increased.

W.H. Pierre's classical research on residual acidity or basicity of fertilizers was first published in 1928. This work was the basis of the method adopted by the Association of Official Agricultural Chemists for determining the equivalent acidity or basicity of fertilizers. The research program in soils has remained strong, with a well-trained staff of soil scientists maintaining a national reputation in research on soil acidity and use of lime and fertilizer.

Because of a sound fertilizer recommendation program that was based on extensive field and laboratory research on experiment stations and hundreds of Alabama farms from about 1910 to 1950, Alabama was the last of the 48 states to establish a state soil testing program. Since the laboratory was established in 1953, it has developed a reputation as one of the best in the Nation. The background in field and laboratory calibration data and the early use of the computer, beginning in 1966, have enabled this laboratory to provide leadership in the field of soil testing. The number of soil samples analyzed increased steadily, reaching a peak of 80,000 in 1978.

As economic pressure on farmers has increased because of low prices of farm products and large increases in cost of fertilizers, the objective for the future is to maintain reliable data on which to base soil test fertilizer and lime recommendations. As minimum tillage, double cropping, irrigation, improved management and varieties, and other changes take place, the department must provide reliable data and recommendations so that returns from the use of fertilizers and lime can be maximized. This will require continuous effort on research stations and expanded activity on farmers' fields to keep abreast of changes taking place on Alabama farms. This must be supported by basic research in soil chemistry, soil physics, soil microbiology, soil mineralogy, and other areas as further changes take place in the future.

A continuous research program on field and forage crops has provided up-to-date information on cropping systems, varieties, dates of planting, spacing, and other management practices. Variety reports are published annually on cotton, corn, soybeans, grain sorghum, wheat, oats, and rye to inform Alabama farmers of best adapted varieties for north, central, and south Alabama. Along with the plant breeding and variety testing program, the agronomy staff has helped develop a program for providing foundation, registered, and certified seed of many crops for Alabama farms. This has resulted in a modern facility on the Auburn campus for processing and distributing certified seed.

In the 1940's and 1950's, management units involving various crop and livestock combinations on designated farm unit areas were operated on many outlying units to provide production and economic data as examples for family farms. In the 1960's and 1970's, these were replaced with more complicated forage and livestock management systems which have provided data for expanding livestock enterprises. These cooperative efforts among agronomists, animal scientists, and substation personnel have helped Alabama farmers move from a row-crop to a more balanced agricultural economy.

Discovery of chemicals that could be used for selective weed control has led to development of an active weed science research program. From its meager beginning in the late 1940's, this program has grown to two senior staff members and several research associates who do basic and applied research on use of hundreds of chemicals on most Alabama crops. This area of activity has brought about many significant changes in Alabama agriculture and is one of the most promising for the future in agricultural research.

From the interest of one staff member in the 1920's, there has grown a promising program in turf research. Recent establishment of a turf research facility is providing information on lawn, golf course, roadside, and recreational turf species, and management practices to support increasing interest and need for such information.

Recent acquisition of a new agronomy research farm on the E.V. Smith Research Center provides the opportunity for expanded research in an ever-changing agriculture. Areas that will receive emphasis include fertility management, minimum tillage, irrigation, weed control, new varieties, and cropping systems.

—Tom Cope

LEFT: Early research established needs for lime.
BELOW: Ornamental horticulture continues to receive research attention.

HORTICULTURE

Research on fruit and vegetable crops had its beginning with the inception of the Alabama Agricultural Experiment Station. Early studies, done by the department head when he had the time or by field workers under the general supervision of the department head, consisted mainly in the adaptation of the best accepted cultural techniques to the fruit and vegetable crops grown in Alabama. Results published in Experiment Station bulletins and circulars, intended for the rural population of the State, endeavored to teach proper crop production techniques to the public.

These bulletins and circulars of the Alabama Agricultural Experiment Station established the recommendations, engendered through research or study, on which the horticulture of the State was developed around the turn of the century. From 1889 to 1916, 22 bulletins were published that established the cultural techniques for most of the fruit and vegetable crops in the State. Recommendations were given for apples, cabbage, cantaloupes, grapes, Irish potatoes, peaches, pears, pecans, plums, raspberries, satsuma oranges, small fruit, strawberries, sweet potatoes, tomatoes, turnips, and watermelons.

The Department of Horticulture, established in 1903, was growing and by the 1920's had several well-trained research specialists who could concentrate on a given crop or area of research. The research itself was becoming more detailed and sophisticated, designed to produce new knowledge, rather than to adapt established knowledge to conditions in the State.

A milestone in the development of horticultural research in the department was the comprehensive research on the growth and fruiting habits of the pecan, conducted by C.L. Isbell. This work, described in 1928 in Experiment Station bulletin 226, is a detailed characterization of the growth and development of the tree, and of the male and female fruiting and flowering buds.

In the early thirties, a study of the nutrition of vegetable crops was begun which was to extend to the present day. A unique feature of the early nutritional research was the establishment of a series of bottomless concrete field bins which could be filled with soil of various types and organic matter contents. These field bins made it possible to conduct research at Auburn on the various soil types found in the vegetable-producing areas of the State. While the research in the bins met some criticism, especially that results from a small bin could not necessarily be applied to a large field operation, it was a unique and interesting technique which produced much valuable information on the nutrition of vegetable crops.

The field bin research of the 1930's, which was expanded to field scale research at the substations in the 1940's and 1950's, furnished the bulk of the nutritional research on which fertilizer recommendations were made for vegetable crops. In addition, the bins provided extensive information on the effects of different kinds of organic material on yield of crops and the rate of organic buildup and residual effects on different soils. This work also involved some of the oldest and most extensive research on irrigation of vegetables in the South.

It was not until 1936 that formal research involving ornamentals was initiated and not until 1948 that the ornamental greenhouses were constructed. With larger and more adequate facilities and staff, research with ornamentals expanded considerably; this expansion has continued to the present day.

Initial research was concerned with the precision growing of greenhouse crops and other floriculture crops. As the ornamental research faculty continued to expand, and as the nursery industry became an important and dynamic industry in the State, ornamental work was expanded to include nursery and woody ornamental crops. The Experiment Station now has a strong ornamental research program at Auburn and in the nursery production areas of the State.

Food processing research in the department supports and complements production projects. Early work in the 1930's and 1940's emphasized new products to be made from the sweet potato and the design of equipment to facilitate the manufacture of these products. In the 1960's, similar studies were developed with the peanut. Currently, the facilities of the laboratory are used in research on improved peeling methods for fruit and vegetables and the cracking of pecans and other nuts, as well as research on improved processing and utilization of southernpeas. Largely through the efforts of the food processing staff, the department has one of the best equipped food processing laboratories in the South.

Whereas, early fruit and vegetable investigations in the department through the 1950's emphasized the maximizing of yields on small intensively cultivated acreages, current research is concerned with production and management practices designed to increase efficiency in production. Gone are the field bins for nutritional studies. Such research now is done at the new horticulture farm, at substations, or on farmers' fields, and is done cooperatively with the Soil Testing Laboratory so as to coordinate laboratory recommendations with actual results in the field.

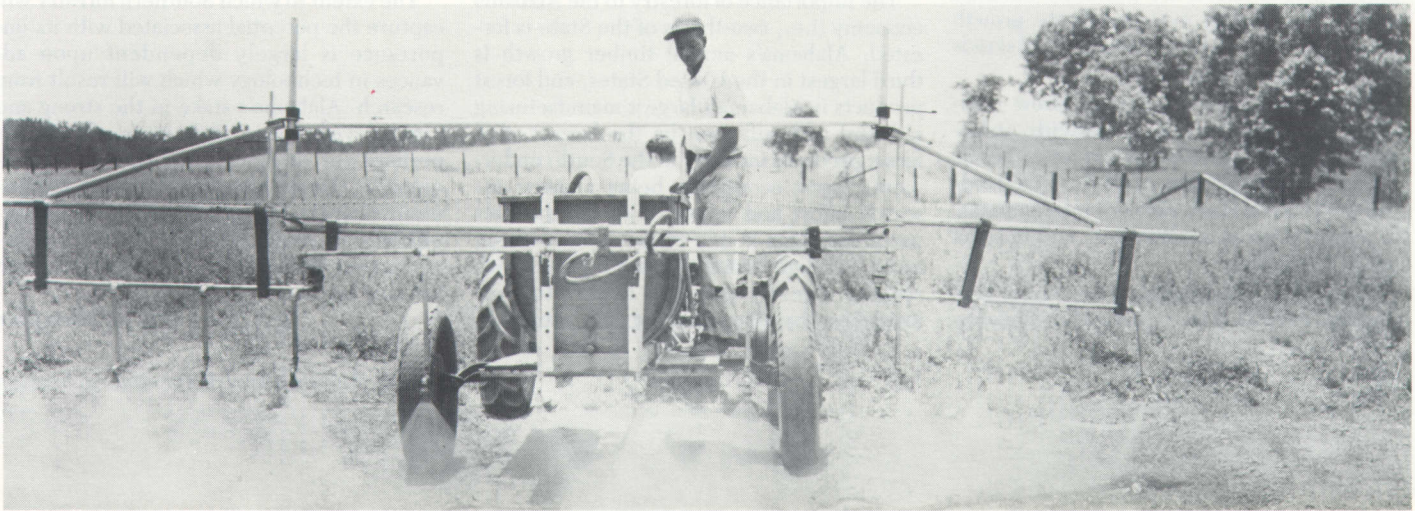
Breeding programs on cantaloupes, watermelons, southernpeas, tomatoes, and plums emphasize the needs of both commercial growers and gardeners through development of improved varieties and germplasm which are productive and more resistant to disease, nematodes, and insect pests, as well as having improved appeal and quality for the consumer. This work is supported by fundamental studies, cooperative between plant breeders and food scientists, on the chemical and physical nature of pest resistance in plants. Research on ornamental greenhouse crops continues while the expanded ornamental faculty rapidly organizes research to continue support of the State's nursery industry.

—Donald Y. Perkins

FORESTRY

Forestry research in the Alabama Agricultural Experiment Station officially began with establishment of the Department of Forestry in 1947. However, a limited amount of forestry research was conducted by Experiment Station personnel 20 years earlier. In 1927, three species of southern pine were planted on badly eroded farmland as part of an erosion control study. During 1932-33, extensive experiments with four southern pines were initiated by planting nearly 80 acres on the Auburn University campus. And, during the 1940's, experimental forest areas were acquired in Fayette, Autauga, Coosa, and Barbour counties. Some of the early field studies initiated on these areas continue today.

Some of the earliest research dealt with wood joints and service life of treated posts. Other early forestry research involved forest nursery management. Nursery research, initiated in the early fifties, has continued as a major theme with a number of scientists



Herbicidal research in forest nurseries has advanced from use of mineral spirits in 1954 (below) to trials with more economical ultra low volume herbicide treatments (left).

involved from then to the present. Research in forest photogrammetry and photo-interpretation also began in the 1950's and has provided a number of photo-interpretation keys for various forested portions of Alabama.

Another area of research with a continuing history is forest genetics, which began in 1954 when the Experiment Station joined a regional project in forest genetics and tree improvement. Much of the effort in genetics has been in cooperation with the Alabama Forestry Commission and is designed to provide genetically improved stock for Alabama forest landowners through the Commission nurseries.

Research emphasis in forestry from the 1950's through the mid-1970's was in forest biology and wood products. While some of this research, particularly in tree physiology and in identifying physiographic regions, was basic in nature, most studies were applied and many were conducted on the Station's experiment forests.

Beginning in the mid-1970's, forestry research efforts were studied and redirected. In the last 5-year period, 1977-82, new research was started in forest economics, timber harvesting, wood chemistry, production management, silvicultural herbicides, regeneration systems, and forest biometrics.

Current forestry research is categorized into five broad areas: forest biology, forest measurements/biometrics, forest management/economics, forest engineering/timber harvesting, and wood science/forest products.

The overall goal of forest biology research is to provide information for solving biological and silvicultural problems encountered by foresters and forest landowners in Alabama and the South. The economic importance of the forest industry in the South generally, and Alabama in particular, justifies an emphasis on biological research that is likely to provide an economic impact, i.e. applied research. However, the crucial nature of basic or theoretical research is also recognized and continues to be addressed.

Research in forest measurements/biometrics is primarily concerned with developing better estimates of growth and yield for forests in Alabama and the Southeast. Current efforts are primarily directed toward developing more adequate growth projection systems for existing natural stands and young pine plantations.

The overall research goal in forest management/economics is to provide information to the forest-based industry, public agencies, and private nonindustrial landowners to allow more efficient management, to improve resource allocation, and to assist policy formation.

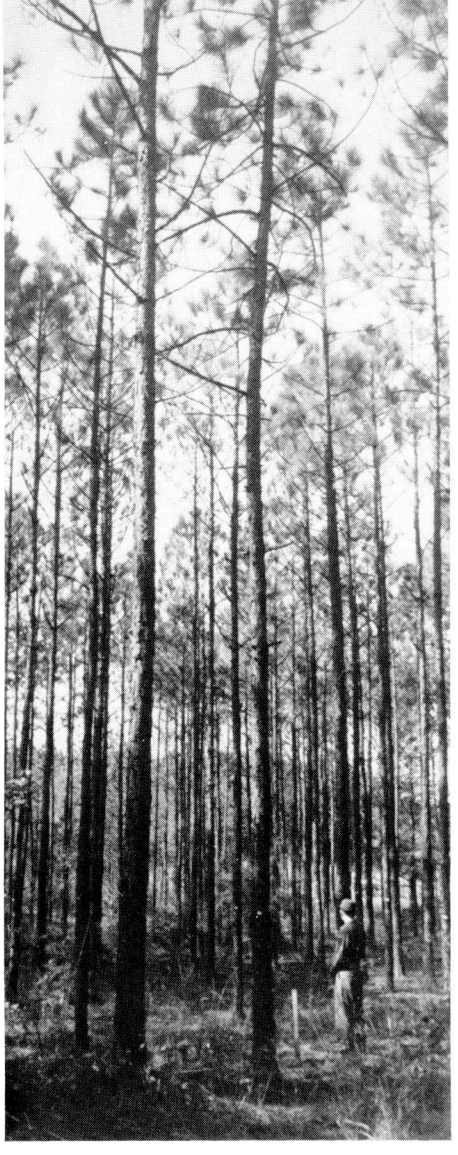
The goal of forest engineering/timber harvesting research is to improve the efficiency of forestry operations. A major portion of the raw material cost for wood conversion processes can be attributed to harvesting/engineering aspects. Forestry operations, including stand establishment, site preparation, planting, and harvesting are becoming increasingly mechanized. Thus, cost reductions through engineering applications are increasingly possible and important. Current studies involve improved systems for mechanically thinning southern pines and developing ownership and maintenance strategies for forestry equipment.

The Department's forest products research interests include traditional products and also the possibilities of developing new products and using forests for energy. With the current and projected rapid growth of the forest products industry, there is constant demand for new information which can be supplied only through research.

While the Department's overall research goal requires pursuit of excellence in a broad array of forestry research activities, scientists in the Department have identified three opportunities through which the Experiment Station can make particularly significant research contributions to Alabama and to Southern forestry. These are: artificial forest regeneration from nursery management through stand establishment, forest economics, and forest engineering/timber harvesting.

The Alabama Agricultural Experiment Station has a long history of successful research in the area of forest regeneration; forest nursery research has been an integral part of this history. Beginning in the 1950's, there have been continuing studies in various aspects of forest nursery production. Today, Auburn is the center for forest nursery information in the Southeast. Forest nursery research is conducted through a university/government/industry research cooperative entitled the Southern Forest Nursery Management Cooperative. This effort, in combination with another regional research cooperative, the Silvicultural Herbicide Cooperative, plus other studies to develop alternative pine regeneration systems, forms the basis for an opportunity to achieve national leadership in forest regeneration.

The importance of forestry to the Alabama economy (i.e., two-thirds of the State is forested, Alabama's annual timber growth is third largest in the United States, and forest products is Alabama's largest manufacturing industry and will soon be the largest state forest products industry in the South) underscores forest economics being a major research effort and opportunity for the Department. This is one of the new research areas initiated during the past 5 years, with results already proving useful to policymakers by documenting the economic importance of foresty to the State and to landowners by developing economic guidelines for managing various forest types.

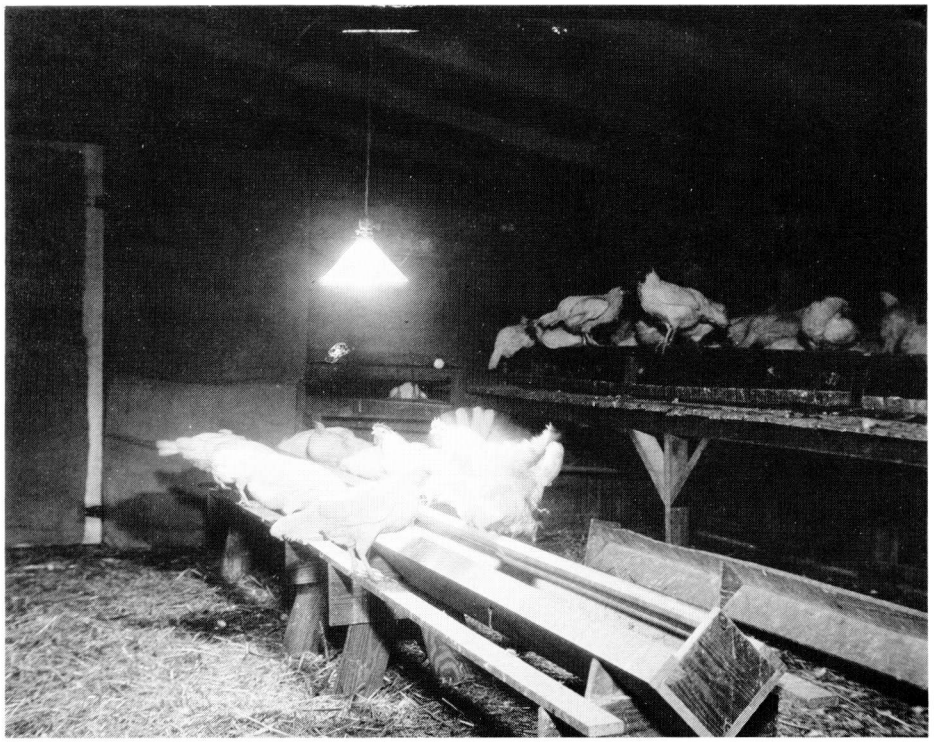


Fast growth of pines on eroded area planted in 1927 established the potential for profitable production in Alabama.

Auburn has perhaps the greatest opportunity for forestry research contributions through forest engineering/timber harvesting. This research program (initiated in 1979, with faculty availability and commitment in both engineering and forestry) has potential which is not possible at universities without this faculty combination.

The extent to which Southern forestry will capture the potential associated with its importance is largely dependent upon advances in technology which will result from research. Alabama's stake in the strong and rapid development of Southern forestry is perhaps the largest of any State's. Consequently, the Alabama Agricultural Experiment Station has an opportunity to significantly contribute to the economic development of the State and region through forestry research.

—E.F. Thompson



Hens feeding under all-night lights were part of early lighting research that began in the early 1930's.

POULTRY SCIENCE

The first research work with poultry at Auburn was an attempt to upgrade the nutrition of the chicken in the early developing industry by comparing different sources of feed materials. This work began in 1924 with continuation into the depression years when emphasis was a "live at home" program. Comparisons of different grazing crops for poultry included common and sericea lespedeza, alyce clover, cowpeas, soybeans, and kudzu.

The Department of Poultry Science was established in 1947 with D.F. King as head. Earlier work had been as a part of the Animal Industry or Animal Husbandry departments, except for a 5-year period (1929-34) when it was organized separately.

Much of the early Experiment Station work with chickens involved management of farm flocks and included such studies as forced molting and light management in an attempt to produce eggs the year round. Force molting for off-season production was not too successful because day lengths were decreasing at this time of the year. Work by King and G.A. Trollope in the early thirties combined force molting with the use of artificial lights to overcome the early problems. Fall and winter egg production was increased approximately 50% by using light in conjunction with force molting.

Renewed interest in light management developed in the late 1950's, with effects of length of day during the growing period and laying house performance of egg-production birds studied. From this work, the term "stimulighting" was coined, and commercial poultry producers over the country began to adopt lighting programs utilizing reduced light during the growing period and increased light during the laying period.

Along about this time, it was also recognized that light influenced growth rate and feed efficiency. Although considerable work has been done at other institutions in this area, some of the first work was done at Auburn indicating that restricted light was important in the area of growth stimulation.

When interest in poultry production at a commercial level first began in the Southeast, it was with the idea that the southern climate made it possible for birds to be maintained without providing housing necessary in other areas of the country. To evaluate this hypothesis, work began at the Station's Sand Mountain Substation using shelters with various amounts of enclosure. Data indicated it was not practical to leave birds to the mercy of the elements. As part of this work, an economical house for "backyard flocks" was designed at Auburn using burlap bags coated with several layers of a thin cement mixture—called a "sack-cement poultry house."

To make the most efficient use of the southern climate, King introduced a system of cage management in 1947 similar to that used extensively on the West Coast. The cage method of maintaining egg-type birds quickly became popular in the Southeast and opened up avenues of research at Auburn on cage size and density, house design, fly control, feeding, and disease control methods.

Research on disease control first began in 1934 with the development of the Auburn Strain of Single Comb White Leghorns bred to resist leukosis disease. The early recognition that diseases and parasites must be controlled to have a profitable poultry industry has greatly influenced the direction of research programs in poultry. Since disease and parasite control could not be separated from management, breeding, feeding, and housing, this work was assigned to the Alabama Agricultural Experiment Station. Auburn is unique in this arrangement and continues to be a leader in the United States in these areas.

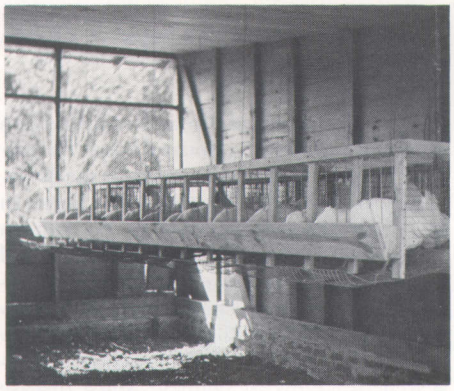
In addition to the continuing work in disease control related to viral, bacterial, and protozoan organisms, major emphasis has been on the feasibility of maintaining broiler breeders in cages for the production of hatching eggs by use of artificial insemination, the correction of shell quality problems by nutritional and physiological manipulation, energy and environmental conservation use in broiler and egg type operations, and the physiological effects of blood types present in the chicken.

Research at Auburn has led to four patents for products useful to poultry production. A machine invented by King allows detection of fertile eggs after a short period of incubation, effective vaccines have been developed by S.A. Edgar for the control of coccidia and by E.C. Mora for the control of cholera, and a beak remover was developed by G.R. McDaniel in cooperation with faculty of the Mechanical Engineering Department. This machine is currently being used extensively by the turkey industry. At present, a vaccine to control turkey coccidia is being perfected.

With the highly technical nature of today's poultry industry, both basic and applied research will be required to provide knowledge for uninterrupted improvements in efficiency. Major advances in poultry research will depend on discoveries in all scientific disciplines. Management techniques will be modified or adopted to maximize feed, energy, housing, labor, and disease control.

Of the many intimate areas associated with intensive animal agriculture, health problems move to the forefront. More effective and safe disease control methods are necessary. Research in the future must point in the direction of safer, less stressful immunizing agents with fewer side effects than the present live attenuated antigens.

Many other areas associated with intensive production must be researched. Critical



These cages, built at Auburn in 1947, were the forerunner of the Southeast's cage industry.

temperature ranges for better meat and egg-type birds must be established if continued progress is forthcoming in the area of reproductive efficiency. Lighting, feeding, and general management programs for broiler breeders must be improved, particularly in view of the high probability that dwarf breeders and caged management systems are to be the productive method of choice. Semen biochemistry, mechanics associated with sperm motility, and female effects on fertility duration are major obstacles in reproductive efficiency advancement.

The demands placed upon the present-day chicken have compounded egg shell problems in both broiler breeders and table-egg producers. The basic mechanisms involved in shell calcification, which result in thin-shelled, shell-less, and pimpled eggs, must be determined. Not unrelated to this, as well as growth rate, is the optimum nutrient requirements of the chicken, which must be considered on the basis of the economy of production.

—Claude H. Moore

CROP VARIETY DEVELOPMENT

Among the highly visible contributions of Auburn agricultural researchers are the large number of crop varieties released by the Agricultural Experiment Station. Included are varieties of field, forage, soil building, and turf crops—generally classified as agronomic crops—and such horticultural crops as vegetables, fruits, melons, and nuts.

Although some releases date back to the 1920's and 1930's, most are products of the post-World War II period, a time when funding permitted more of the detailed and costly procedures necessary for plant breeding. In all cases, the varieties were bred or selected to fill specific needs of Alabama farmers, gardeners, and homeowners—not to compete with commercial seed companies. For example, resistance to diseases, insects, and other pests has been a major characteristic built into both horticultural and agronomic varieties. Product quality, adaptability to Alabama farming conditions, and needs of particular commodity groups have been the basis for other developments.

The first recorded Auburn variety release was *Zoysia matrella*, a desirable turf grass discovered by D.G. Sturkie while evaluating grasses for potential forage use. This discovery has been given major credit for development of Alabama's important turfgrass industry and the beautiful lawns that homeowners now enjoy.

In the horticultural line, Alabama No. 1 pole bean has had a profound influence on the vegetable industry since its release at Auburn in 1938. From the work of Charles L. Isbell, this variety is recognized as the first nematode resistant breeding stock of snap bean in America. Not only has this variety played a major role in bean breeding work for 45 years, it still continues to be a popular variety in its own right.

The following list of Auburn variety releases illustrates the wide range of crops made available through work of the Agricultural Experiment Station. Year of release is given for each.

HORTICULTURAL CROPS

Pole beans
Alabama No. 1 (1938)
Mild White Giant (1946)

Southern peas
Alacrowder (1946)
Alalong (1946)
Giant Blackeye (1956)
Early Purple Hull (1959)
Knuckle Purple Hull (1959)
Freezegreen (1979)

Cantaloupes
Southland (1970)
Gulfcoast (1971)
Chilton (1972)

Pimiento pepper
Pimson 1, 2, 3, (1956-58)
Big Hart (1969)

Tabasco pepper
Greenleaf Tabasco (1970)

Tomatoes
Atkinson (1966)
Auburn 76 FMN (1977)

Plums
Crimson (1973)
Purple (1973)
Homeside (1975)
Bruce 12-4 (1976)
AU-Producer (1978)
AU-Roadside (1982)

Chinese chestnuts
AU-Cropper (1980)
AU-Leader (1980)
AU-Homestead (1980)

AGRONOMIC CROPS

Cotton
Plains (1949)
Auburn 56 (1953)

Crimson clover
Auburn Reseeding (1946)

White clover
Regal ladino (1962)

Arrowleaf clover
Yuchi (1967)

Grasses
Zoysia matrella (1927)
Auburn Reed Canary (1981)
AU Triumph tall fescue (1981)
AU Oasis phalaris (1981)

Vetch
Auburn Woollypod (1946)
Warrior (1959)
Cahaba White (1977)
Vantage (1977)
Vanguard (1977)
Nova II (1977)

Sericea
Serala (1962)
Interstate (1970)
Serala 76 (1978)
Interstate 76 (1978)
AU Lotan (1980)

Corn
Auburn 602 (1960)

Grain sorghum
Combine Sagrain (1946)

Vertical transmission of brucellosis is being investigated in these facilities.

ANIMAL HEALTH RESEARCH

The Department of Animal Health Research was established in 1953 as a joint effort between the Alabama Agricultural Experiment Station and Auburn's School of Veterinary Medicine. Its purpose was to study major health problems affecting food producing animals in the State of Alabama.

The laboratory was first located in space allocated in the old serum plant, which also served as the State Veterinary Diagnostic Laboratory. In 1955, the unit moved into a small isolation facility accompanied by several acres of pasture to provide room for a modest population of experimental animals. In 1962, the unit moved to its present location on 96 acres of land within the School of Veterinary Medicine Complex and includes the following major facilities: a research laboratory, an office building, a 16-stall isolation building, a necropsy building, and barns for storage of hay and equipment.

Since 1962, there has been added a calf barn with 96 individual stalls for parasitology research, a swine gestation facility, and a small swine farrowing unit. In 1979, the unit was provided the use of the old North Auburn Dairy Unit to house a study on bovine leukosis disease, and the old Beef Cattle Unit was made available for a 5-year study on the vertical transmission of brucellosis.

Early research work by the Department of Animal Health Research consisted of looking at enzootic infertility problems of cattle. It was concluded that the nonspecific infections associated with cattle were not as important as originally believed and antibiotic treatment did not increase conception rate in repeat-breeding cattle. The leptospirosis vaccine used in the 1950's had protective value but prevented neither subclinical infection nor the spread of disease. Findings of a study on internal parasite problems of food animals resulted in several antihelmintic drugs gaining approval from the Food and Drug Administration; these drugs are on the market today.

The physiology of the male reproductive system of domestic animals has been studied with the basic mechanisms of the breeding process being the primary focus. Results of this research provided the physiological explanation for the common clinical problem of hematoma of the penis of the bull. These studies provided the basis for a surgical procedure to correct one type of impotence in bulls. Thus, valuable bulls suffering from this problem can be returned to service.

The immune response of cattle to viruses and other toxic or pathogenic substances has been a principal activity. A permanent bovine tissue culture cell line has been developed and currently is in use worldwide by investigators to aid in the diagnosis of virus disease. Studies have shown that bovine fetuses are capable of producing cell-mediated immune responses to a variety of substances; however, at birth these responses are significantly less than in older calves. This is one reason why newborn calves are more susceptible to disease than older animals. Recently, a simple accurate assay was developed for detecting and quantitating noncytopathogenic strains of bovine viral diarrhea virus.

Studies on swine dysentery have emphasized the organism, *Treponema hyodysenteriae*, which causes a severe diarrhea in pigs of all ages. The pigs often remain carriers of the organism for as long as 115 days, and it has been shown the organism can survive in the environment up to 30 days. On investigating several swine herds with dysentery it was found the cycle can be broken by proper management practices.

The incidence of bovine leukosis-carrying antibodies in cattle of Alabama is 40% for dairy cattle and 19% for beef cattle. Findings thus far indicate transmission of virus via semen is insignificant. In addition to the study of vertical transmission of the brucella organism, other work is being conducted on the immunopotentiation of strain 19 brucella vaccine. If the efficiency of this biologic agent can be improved, it will greatly aid in the eradication of brucellosis from cattle in the Southern United States.

Other areas of research include the respiratory disease complex (shipping fever) of cattle, blue tongue virus, and the transmission of viral and bacterial organisms from dam to offspring within the embryo or sperm. With the increased acceptance of embryo transfer, this type of disease transmission becomes important because a disease agent could be spread rapidly throughout the livestock population.

—S.D. Beckett

ZOOLOGY-ENTOMOLOGY

Early research provided effective control for insects of vegetables (left) and ornamentals (right).

Land-grant colleges had already assumed research responsibilities before agricultural experiment stations were established, because of the paucity of information available for teaching. As a consequence, research in zoology at Auburn antedates the establishment of the Alabama Agricultural Experiment Station. Professor W.C. Stubbs and his associates had made large collections of the State fauna and identified and catalogued them, but these collections and records were destroyed when Old Main burned in 1887. Thus, when George F. Atkinson became the first Experiment Station biologist in 1889, he began his research without collections or records.

Atkinson's researches were in the area of economic zoology and dealt largely with preparations for insect control. He also studied plant nematodes. In the late 1890's, economic entomology research was underway on insect pests of farms and gardens. A list of injurious and beneficial insects of the State was compiled and the first Experiment Station entomologist, C.F. Baker, reported the San Jose scale in the State. W.E. Hinds came in 1907, and from his study of cotton insects he became concerned as early as 1908 that the boll weevil would move into Alabama; and indeed it did, being found in Mobile County in 1910.

Entomology research in the early 1900's included the collecting of economically important insects, insect life-history and biology research, insect photography, and studies on the control of rice weevil in corn, boll weevil, cotton leaf worm, San Jose scale, fall armyworm, and other important pests. By 1914, the boll weevil had crossed Alabama and spread into Georgia. In 1916, Hinds made 88 public addresses to more than 17,000 people concerning Auburn's research on this and other insects. He also served as chairman of the Association of Cotton Entomologists, a group active in planning and coordinating research on boll weevil and other cotton insects throughout the cotton belt.

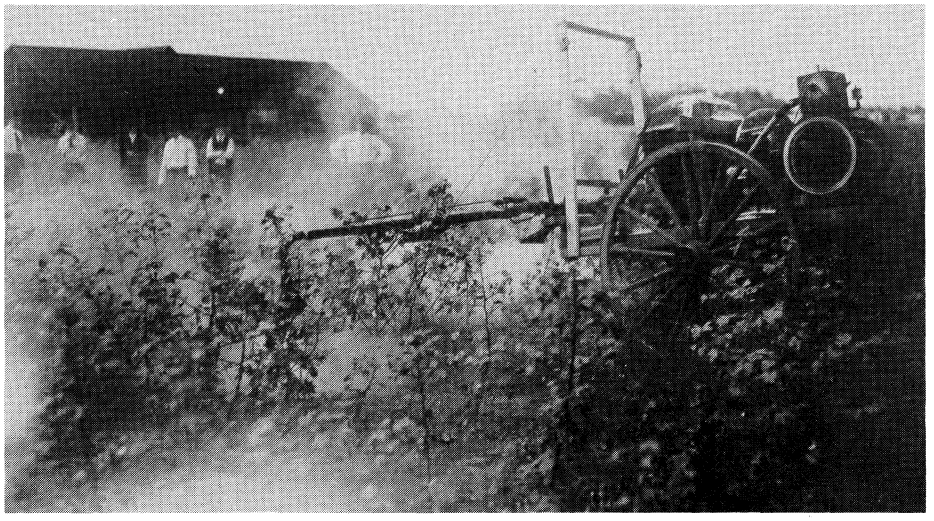
On October 16, 1920, Comer Hall burned and the fire destroyed the collections of insects and the books, records, photographs, and equipment of the researchers. That same year the Mexican bean beetle was discovered in the State. Insects of citrus were researched by L.L. English who later worked on the control of azalea and camellia pests.

In the 1930's, F.S. Arant produced classic monographs on the life history and control of cowpea curculio, southern corn rootworm, and cotton insects. He made extensive plantings of devil's shoestring, from which he selected plants and analyzed them for rotenone, which was an important insecticide. This work was interrupted by World War II.

The discovery of the insecticidal properties of DDT during World War II and the subsequent discoveries of other chlorinated hydocarbons and organic insecticides that could kill insects provided an impetus to test insecticides against all sorts of insects. During the period from 1945 through the 1950's, research in entomology at the Alabama Agricultural Experiment Station was a testing program that resulted in adequate control measures for almost every economically important insect in the State. One prime discovery was an effective bait for control of the imported fire ant. Other research on the imported fire ant was important in establishing the economic status of the insect and in dispelling a vast amount of misinformation.

In the late 1940's and early 1950's, entomologists of the Alabama Agricultural Experiment Station pioneered research that led to control of cotton insects with minimal use of insecticides, i.e., applied only when insect infestation counts showed the need for control. This was before the terminology "integrated control" and "pest management" had come into use—at a time when "womb to tomb" applications of insecticides to cotton were practiced over much of the cotton belt.

As insect resistance to pesticides appeared, insecticidal residues were discovered on crops, and scientists found that some insecticides were carcinogens or mutagens and had a detrimental effect on the environment. Research at Auburn turned to studies on toxicology, residues, resistance to insecticides, insect pathogens, and parasites, as well as safety in insect control with chemicals. In this connection, research by entomologists and wildlife biologists showed the castastrophic effects on non-target animals of broadcast applications of long-residual insecticides to large tracts of land for fire ant control. This research had a major impact in halting plans to apply heptachlor to



Researchers observe cotton insecticidal dusting in the early days of boll weevil control research.

some 120 million acres in the Southern United States in an effort to eradicate the imported fire ant.

Research in entomology in the 1970's and early 1980's has been primarily commodity oriented and based on the principle of integrated pest management. Insects of economic importance to the following commodities are included: forests, vegetables, pecans, corn and other grain crops, cotton, peanuts, soybeans, ornamental plants, and insects affecting man and animals. Programs in insect taxonomy, insect pheromones, and biological control are also underway.

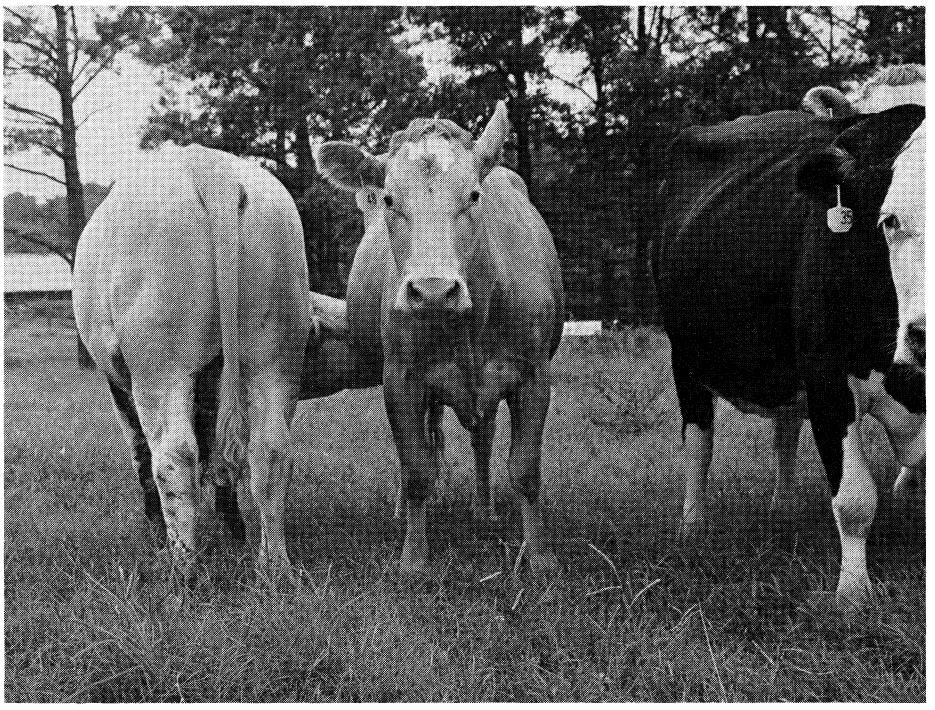
Research in wildlife was initiated in 1936 and the work of A.M. Pearson on the mourning dove biology and management is often cited as a classic in wildlife ecology. The other early work was primarily directed at farm game management. The change of farming from row crops to pastures and forests initiated a change in wildlife research and by the late 1950's the emphasis was on quail, deer, and turkey. In the 1970's, the discovery that woodcock breed in the South in the winter and that they occur in high populations made this species a new huntable resource. Almost all research in wildlife in the 1970's was aimed at birds, with the turkey, mourning dove, and waterfowl receiving almost as much attention as the woodcock. Although the trend has continued into the 1980's, governmental and public pressure has instigated research into the biology of non-game species and methods of their management.

Fisheries research began in Zoology-Entomology in an informal way in the 1920's when F.E. Guyton began to collect fish for identification. By the 1930's the fish fauna was probably better known than any other group of animals in Alabama. Formal research in fisheries was begun in the Department of Zoology-Entomology in 1934 by H.S. Swingle. This program grew rapidly following World War II, and a separate Department of Fisheries and Allied Aquacultures was established in 1970.

Research in zoology began in the mid-1930's with the work of R.O. Christensen on internal parasites of poultry. This program is still a modest one, conducted primarily in the spare time of teachers and with emphasis on physiology, genetics, parasitology, and natural history of Alabama vertebrates.

—F.S. Arant
Kirby Hays

ANIMAL AND DAIRY SCIENCES



Spectacular improvement in weaning weight came about through crossbreeding research.

Animal research was begun almost immediately after the Agricultural Experiment Station was established, long before the Animal Industry Department was established in 1907 with Dan T. Gray as head. Director J.S. Newman wrote in his 1883 report: "The only experiment so far conducted with cattle has been that of intense inbreeding with thoroughbred Jerseys over a four-year study with favorable results." Twelve bulletins were published during 1890-1907 reporting on experiments with beef cattle, hogs, sheep, and dairy cattle fed on various Alabama grown feeds. The next few years saw research emphasis on development of rations for beef and dairy cattle.

The Department's research program was expanded to include basic research in animal biochemistry and nutrition, an area destined to draw international interest to Auburn, in 1922. All staff doing research with poultry,

Growing out calves on winter annuals has consistently given substantial per acre and per animal returns in long-time Auburn research.

swine, sheep, dairy cattle, beef cattle, and laboratory animals moved into the first wing of the current Animal Sciences building when it was completed in 1930.

In 1947, the departments of Animal Husbandry and Nutrition, Dairy Husbandry, and Poultry Husbandry were formed as separate units, with the Laboratory of Animal Nutrition also a separate unit of the Experiment Station. In 1950, animal husbandry and nutrition were incorporated into the Department of Animal Husbandry, with a separate Department of Dairy Husbandry maintained. These two were then merged in 1970 to form the Department of Animal and Dairy Sciences.

Early work by W.D. Salmon was on fractionation of vitamin B, confirming that this growth factor was water soluble; further, it was discovered there were at least two growth factors. The factor associated with polyneuritis in birds was sensitive to heat and alkaline solutions (later termed B_1); the "other" growth factor was a mixture, later proving to be principally riboflavin (B_2) and niacin.

One of the first two descriptions of acute deficiency of choline in experimental animals was accomplished in this department. In expanded studies, coronary, aortic, and myocardial lesions resulting from choline deficiency in rats were described. The first description of dietary vitamin B_{12} and folic acid effects upon choline and methionine requirements of experimental animals was provided by research at the Alabama Agricultural Experiment Station.

Data from Auburn's beef bull test, the oldest continuous one in the Nation, and selection experiments have resulted in significant improvements in weaning and yearling weights of Alabama cattle. In addition, extensive research in crossbreeding has resulted in improvement in reproduction, weaning weight, and post-weaning gains in beef cattle. Current research is directed towards formulating breeding programs that will maximize heterosis and additive effects contributed by both sire and dam breeds, and to learn about growth and development as related to mature size, rate of maturing, composition, and economics of production.

Animal nutritionists have worked closely with agronomists for many years utilizing new and established forage varieties in the development of production systems with the potential for carrying lightweight calves at weaning to heavier weights. The most significant of these utilized winter annuals and legumes to take 400- to 500-lb. calves to weights of 700-800 lb. Both returns per animal and per acre have been substantial. The findings that a fungus is associated with poor performance of cattle on tall fescue should make this crop of greater value to cattlemen.

Extensive research with summer annuals has generally proved that they are uneconomical because of poor animal performance. However, creep grazing of the new forage Tifleaf-1-pearlmillet and steer grazing on the Auburn-developed AU Lotan and Serala sericeas indicate the possibility of profitable use of summer pastures.

Extensive research was conducted on the utilization of animal waste by beef cattle. Poultry litter, in combination with corn, produced excellent and economical gains. Methods of recycling waste for refeeding were developed that enhance feed efficiency, reduce pollution problems, and result in high quality steaks and roasts.

Swine breeding research has established that the best terminal cross is Duroc boars mated to Hampshire-Landrace crossbred sows.

Auburn research proved conclusively that zinc supplementation of pigs maintained on concrete floors completely prevented parakeratosis. Now, all commercial pig rations are supplemented with zinc.

A process has been developed to collect and screen swine fecal waste so the solids can be used as a feed ingredient. This product can replace 60 to 70% of the grain used in sow gestation rations and has excellent economic potential for swine producers.

Studies of animal growth and development have revealed that the rate of production of thyroid hormones is related to the rate of growth in swine.

Significant improvement in the dairy industry dates from early input by dairy scientists into artificial insemination. In addition, crossbreeding studies with Holstein bulls on Jersey cows produced rapid increases in production.

A cooperative study between dairy scientists and the USDA Animal Disease Laboratory showed that outdoor portable pens controlled coccidiosis in dairy calves. This method has been widely adapted in the South.

Meats research has centered on carcass composition and processing technology. Investigations into gas atmosphere storage of fresh meat revealed that the microflora were altered significantly in high CO_2 atmosphere because it enhances the production of microorganisms favorable to extended storage of fresh meat. Most packaged fresh meat is now gas-flushed in commercial packaging plants. Recently, restructured fresh meat research has been the dominant activity of the meat scientists. The process developed and patented by Auburn is receiving widespread attention.

Alabama has the potential to be the center of the livestock industry in the next 30 years, and a strong animal research program is planned to help the State's livestock industry expand to a national and international status. Since the period of abundant national resources and low cost energy has passed, future Auburn animal science research will focus on efficiency of resource utilization for animal production and marketing. Alabama has the resources to produce enough grain to feed one million head of cattle a year for the retail market. Attaining this goal will require a cooperative effort among marketing, production, and product technology researchers.

Alabama livestock producers consistently identify reproduction efficiency as a top priority need for research. This area will receive major emphasis in the future. Protein production and synthesis will be a new research area for the Department of Animal and Dairy Sciences.

Genetic increases in rates and efficiency of protein production will be another major research direction for the department. With current knowledge, we have genetically described the breeds and groups in terms of physical measurements, but we know essentially nothing about the functional basis of genetic variation in physiological traits such as enzymes, hormones, and various intracellular functions that cause enormous variation among animals for such economically important traits as meat and milk production. We will initiate research to fill this knowledge void.

—T.B. Patterson
D.R. Strength
D.G. Topel

BOTANY, PLANT PATHOLOGY, AND MICROBIOLOGY

The history of botanical research at Auburn covers the full 100-year history of the Alabama Agricultural Experiment Station. By 1903, the subject matter of botany was expanded into a curriculum in a department of the newly renamed Alabama Polytechnic Institute—the forerunner of Auburn University's present Department of Botany, Plant Pathology, and Microbiology. Although the department has always been substantially a teaching unit, its connection with the Alabama Agricultural Experiment Station has encouraged the development of strong research programs within the department that have made important contributions to Alabama agriculture. The major thrusts of that research have historically involved the diagnosis and control of plant diseases and plant physiology, both of which are important to Alabama agriculture and forestry.

Several noteworthy research contributions have been made by Experiment Station scientists and associated faculty and students in botany and allied subjects. Among the more outstanding of these contributions were those of George F. Atkinson. Atkinson spent merely 3 years (1889-92) at Auburn, but his publications covered a variety of topics ranging from basic mycology to plant disease diagnosis and from plant physiological disorders to plant-nematode associations. Atkinson's most significant works from the standpoint of Alabama agriculture were on diseases and physiological disorders of cotton. He demonstrated convincingly that cotton "rust" could be corrected by use of potash fertilizer, a practice soon widely adopted that led to significant increases in cotton yields in the South.

Benjamin M. Duggar, another early and distinguished alumnus of the Alabama Agricultural Experiment Station, was trained in mycology by Atkinson. Duggar, a native of Gallion, Alabama, received the M.S. degree from Auburn in 1892 and spent the next year as assistant director of the Experiment Station, working at the Canebrake Experiment Station in Uniontown. Although at Auburn for only a short period, he had a long and distinguished career in academic botany and industrial microbiology, highlighted by the discovery and development of the antibiotic aureomycin. A prestigious lectureship of the Alabama Agricultural Experiment Station is named in his honor.

Atkinson and Duggar were pioneer leaders in Alabama for research in mycology, plant pathology, and plant physiology. They

TOP OF PAGE: Mycotoxicological research has identified a fungus that is implicated in fescue toxicity of cattle. Its effects are illustrated by the steer on infested fescue (left), contrasted with those on "clean" fescue (right). BELOW: Donald E. Davis and Mrs. Davis (right) pose with retired department head James A. Lyle and Mrs. Lyle at dedication of Donald E. Davis Arboretum.

set high standards for research accomplishment in these and related disciplines by scientists who were to follow. In succeeding years and until the present, a strong interest in mycology, especially the identification, biology, and control of plant pathogenic fungi, has been maintained at Auburn. Notable among scientists who contributed to this and other research of the department were W.A. Gardner, a soil scientist who founded the Alabama Academy of Science in 1923, and H.S. Ward, Jr., who initiated studies on storage of peanuts which led to a major program in mycotoxicology at Auburn, ongoing since 1960.

From 1929 to 1971, the department was designated the Department of Botany and Plant Pathology, a title that was changed to Department of Botany and Microbiology upon acquisition of a portion of the microbiology program formerly associated with the School of Veterinary Medicine. In 1979, the department's name was again changed to the Department of Botany, Plant Pathology, and Microbiology, the current designation and one that reflects the broad interests of its present faculty. The department has developed into a multidisciplinary unit offering both research and undergraduate and graduate teaching. The department also maintains a herbarium that is the official reference collection of plants for the State of Alabama, and the Donald E. Davis Arboretum, an area devoted to plantings of native trees and shrubs.

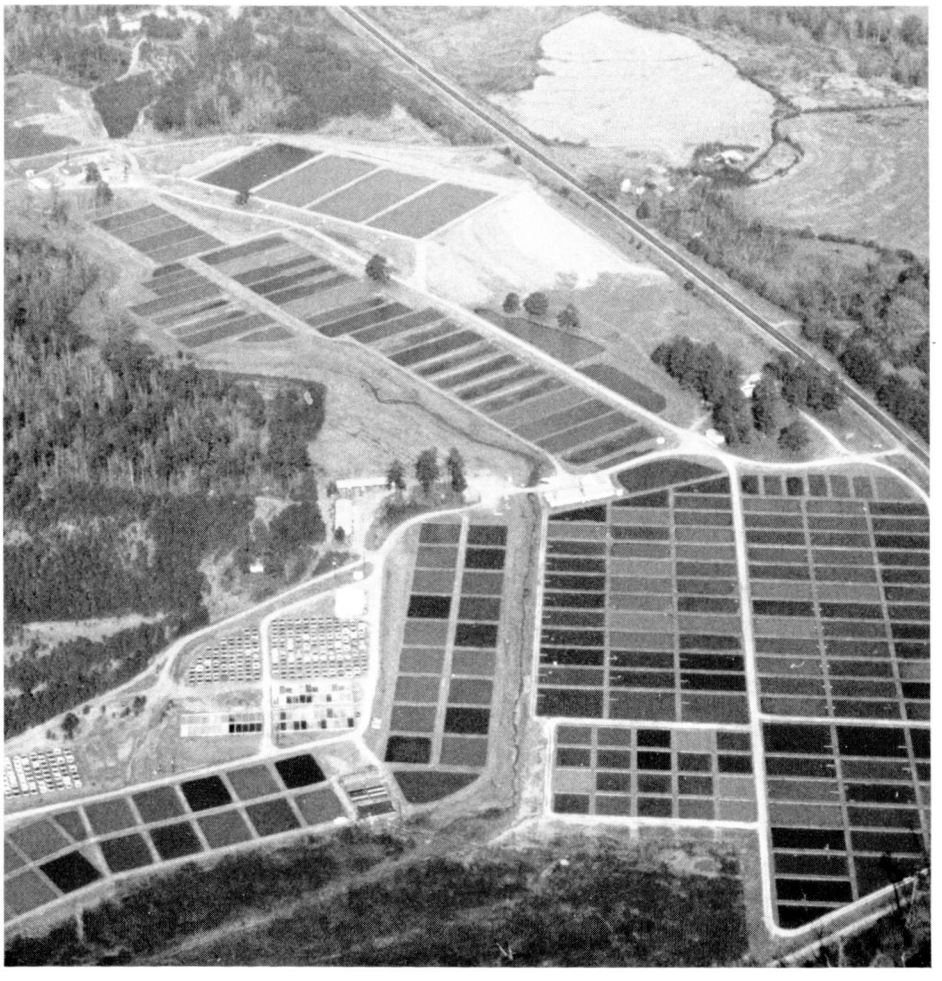
Current research in plant pathology concerns diseases of peanuts, soybeans, horticultural crops, and forest trees. Plant physiological research presently involves herbicide mode of action and the study of lipid metabolism in both higher plants and fungi. The effect of environmental stress on development in soybean plants is under investigation, and ongoing taxonomic research continually documents the flora and fungi of Alabama.

A fungus implicated in toxicity of cattle grazing on fescue has been isolated and identified through the program in mycotoxicology. Efforts are continuing to solve this problem that seriously interferes with beef production on one of the South's widely used pasture crops.

Microbiologists work on photosynthetic membrane biology, enzymatic activities in biomass degradation, identification of unusual phytopathogenic bacteria, and characterization of nucleic acids of toxigenic fungi.

Future research in the department will undoubtedly remain allied to the traditional disciplines of plant pathology and plant physiology, with increased emphasis in biochemistry, genetics, and cellular biology in relation to modern plant science in agriculture.

—Paul A. Lemke



FISHERIES AND ALLIED AQUACULTURES

Additional ponds and facilities have been constructed at Auburn almost every year since 1933, making this the largest warmwater research station in the world.

Auburn's internationally known pond research program was conceived and given birth 50 years ago. It was born of a dismal failure of the Auburn Outing Club, a group of University faculty and townspeople, to build and manage a 13-acre recreational lake. The poor results focused attention on the inadequate and misleading information available.

The early 1930's was a poor time to begin fish pond research. It was not easy during the depression years for the Alabama Agricultural Experiment Station to obtain approval for a project dealing with fish or to obtain federal or State funds for such a project. The Administrator of the Office of Experiment Stations in Washington was fearful that approval would infringe on the rights of the Biological Survey Division of the U.S. Department of Interior. In addition, the Alabama Attorney General, in an advisory opinion, questioned the legality of using State funds on fish research citing the Bible to the effect that "fish are neither flesh nor fowl."

However, H.S. Swingle (an entomologist), E.V. Smith (a plant physiologist), and G.D. Scarseth (a soil scientist) developed a project proposal entitled "Farm Ponds Project." Director M.J. Funchess finally got approval and funding under the Purnell Act. The principal purpose of this act was to support research to improve living conditions of farm people.

The first research ponds were constructed in 1933-34 with W.P.A. labor in the beef cattle pasture on the south end of campus. A 1.8-acre storage pond and 20 earthen ponds, each 1/130-acre, were constructed with the use of mules and slip scrapes. In 1940, the Experiment Station purchased 580 acres of land north of Auburn where twenty-seven 1/4-acre ponds, eight 1-acre ponds, and 13 smaller ponds were constructed. After construction was complete, this is where most of the pond research was conducted. In 1949,

J.M. Lawrence summarized some 15 years of experience acquired from building the research facilities in a bulletin entitled "Pond Construction." This bulletin served as a standard reference on the subject for many years.

Results of experiments conducted in the first few years provided solutions to several problems involved in the management of fish ponds. They found that if there were no emergent or floating weeds or trash present in a pond, there were few or no mosquitoes, and that the weed problems could be solved by a combination of deepening the pond edges during construction, plus fertilization. The research also showed that fertilization resulted in significantly increased production of fish.

In addition, Auburn fisheries researchers discovered that stocking a combination of largemouth bass (a predator) and bluegill sunfish (prey) would result in a "balanced" population that would provide good fishing indefinitely.

Based on their research, Swingle and Smith prepared two leaflets on construction and management of farm fish ponds in 1938, and in 1942 they published a bulletin on "Management of Farm Fish Ponds" that was to become the standard reference for the management of fish ponds in the United States.

The development, through research, of successful techniques of pond management added impetus to the construction of farm ponds. Subsequently, a shortage of bait developed. Experiments on commercial production of bait led to the development of methods for raising redworms, crickets, and minnows. Based on these experiments, a bulletin, "Production of Bait Minnows in the Southeast," by E.E. Prather, J.R.Fielding, M.C. Johnson, and H.S. Swingle was published in 1953. This was the first publication on commercial warmwater aquaculture in the United States.

Experiments on commercial production of various species began in 1944. Methods were developed for producing crops of carp, speckled bullhead catfish, bigmouth buffalo, and channel catfish. There was little demand for carp, bullheads, or buffalo, but channel catfish had long been a favorite food fish in the South. Experiments proved this species to be efficient in feed conversion, to be capable of yielding annual production of up to 3,400 lb. per acre with daily feeding, and to be relatively resistant to diseases and parasites.

In 1958, Swingle published a paper based on several years of research entitled "Experiments on Growing Fingerling Channel Catfish to Marketable Size in Ponds." This research publication provided much of the information base for the development of the catfish farming industry. Later research demonstrated that the channel catfish stocked in ponds was also a desirable species for sport fishing.

Virtually all expansion of the pond research program has come as a result of receiving contracts and grants from a number of State and federal agencies and private companies. The first project was supported primarily with funds from the Purnell Act. Today, research is funded from approximately 50 sources.

The program has received considerable support from the U.S. Agency for International Development (AID) since 1967. Auburn has provided most of the technical assistance in aquaculture and inland fisheries required by AID worldwide. As a result of this association, the Agency has provided some support for research that is applicable in developing countries. In 1970, the International Center for Aquaculture was formally recognized at Auburn and concurrently the Department of Fisheries and Allied Aquacultures was established. Swingle headed up both until his death in 1973.

Fisheries was first housed in the old Miller residence where Funchess Hall is now located. In 1953, it was moved into much larger facilities in the converted Graves Center Dining Hall building. Now the department has a modern building, Swingle Hall, which was occupied in 1972.

The original "Farm Ponds Project" has been revised periodically through the years, and although the major objectives have remained much the same, Experiment Station research priorities continually shift. With rapid industrial development and growing populations, the need for more recreational fishing and for more fish for food has increased dramatically. In response, intensive cultural practices, such as higher stocking densities and feeding rates, have become commonplace in an effort to obtain maximum yields and more economical production. These practices have unearthed a multiplicity of new problems which require increased research efforts. Thus, while studies have been continued on old problems, recent research has and will continue to expand into the areas of diseases, nutrition, reproduction, water quality management, aquatic ecology, fish production systems, and genetics.

—E.E. Prather

H.S. Swingle (right) and E.V. Smith gathered data by draining experimental ponds and counting and weighing fish.

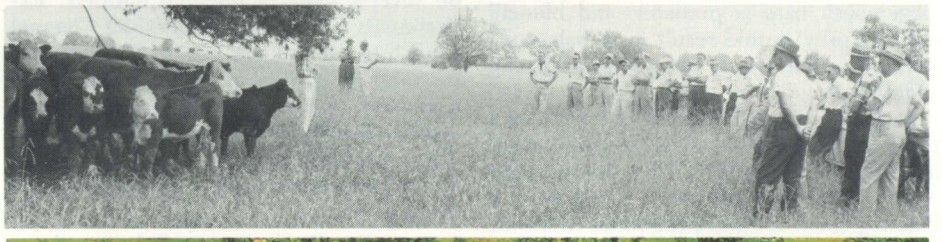
Keeping in Touch with the People

A source of strength and stability of the Alabama Agricultural Experiment Station during its 100-year history has been its practice of keeping in close touch with the people it serves. This has taken the form of both talking and listening—reporting research findings to those who can use them and planning and conducting experiments in response to needs expressed by farmers, agribusinessmen, and other citizens.

The process of providing printed reports of research results, a legislative-mandated responsibility, has been emphasized since the first director prepared annual reports of each year's work. This reporting method has been refined through the years to include a varied series of publications—bulletins, circulars, leaflets, progress reports, annual reports, departmental series, informal mimeograph reports, special brochures, and a quarterly magazine—which have numbered in the thousands. The volume of publications released during succeeding periods mirrors the growth in the total research program. For example, bulletin numbers went from 1 to 310 during the first 75 years, while the total during the last 25 years was 236. This 1958-83 period also saw the publication of 100 issues of *Highlights of Agricultural Research*, the quarterly magazine that had been initiated in 1954, the beginning of the departmental series, issuance of many special leaflets and brochures, and greatly expanded reporting of findings through the mass media.

Another important method of disseminating research results to users, the holding of farmer field days at the Main Station and outlying units around the State, dates back to 1892. Such meetings combine the excellent one-on-one method of teaching with the visual approach, to help sell scientific methods of farming and establish the value of the Experiment Station system in the minds of Alabama citizens.

As important as farmer field days and meetings have been as a vehicle for disseminating research results, they have been equally valuable as a method whereby researchers keep in touch with grass roots agriculture. Interchanges with farmers inform individual scientists and administrators about current problems in specific areas of agriculture, and this has been invaluable in keeping Auburn's research program on target as conditions and problems have changed through the years.



A more formal method of securing grass roots input into program planning has augmented the informal discussion system in recent years. Since 1978, an agricultural advisory committee, with members representing all agricultural and forestry commodity groups, has aided Experiment Station officials in setting research priorities.

TOP TO BOTTOM: Tree spraying demonstration at Auburn around the turn of the century; swine field day at Sand Mountain Substation in early 1950's; fertilizer conference tour at Black Belt Substation in late 1950's; horticulture field day at North Alabama Horticulture Substation in 1970's; and tour of weed control research at Tennessee Valley Substation in 1981.

HOME ECONOMICS RESEARCH

Home economics research at Auburn University was initiated by Dr. Georgia W. Burton in 1926 when Purnell Act funds allowed the expansion of home economics research efforts nationwide. Between 1926 and 1933, there were a number of nutrition projects dealing with the vitamin and mineral content of Alabama foods and with the relationship between diet of young children (6 months to 3 years of age) and rickets.

Home economics research was discontinued in 1934 and was not reinitiated until 1948. It became a department in the Experiment Station in 1950. Between 1948 and 1955, sporadic research efforts in the areas of nutrition and housing were supported. Beginning in 1955-56, under Dean Marion Spidle's leadership, a continuous, sustained research program in home economics was begun with the Alabama Agricultural Experiment Station.

RIGHT: Housing research in the 1950's provided designs that included functional storage spaces. ABOVE: Current nutrition studies are using chickens to learn about cystic fibrosis.

Nutrition research has received the highest amount of support within the Alabama Agricultural Experiment Station as well as the most continuous support. Major areas have included factors affecting food purchasing decisions, determination of the nutritional status of two groups of people (young girls and the elderly) who are considered to be in high nutritional risk, mechanisms involved in nutrient metabolism processes, and the development of acceptable food uses for peanut flours.

In recent years, nutrition research has become more basic in nature and increasingly concerned with nutrition and health interrelationships. Recent work is aimed at solving relationships between nutrient metabolism and health problems such as vascular disease, obesity, and cystic fibrosis.

Housing research was supported in the 1955-1965 decade, and again starting in 1975. The work in the 1950's involved the development of efficient modular storage systems for use in homes, as well as the development of house plans for well-designed, low-cost farm homes. More recent work has dealt with home quality, housing needs, and alternative energy sources for homes.

In the 1960's, textile research was initiated and continues as the second largest area of research today. Much of the research has dealt with textile flammability, mechanisms for flame retardance, and ways to retain the flame resistant properties of fire resistant clothing. Other research areas have dealt with consumer perceptions of fabric properties and the development of laboratory quality control tests that will accurately predict textile performance under consumer-use conditions. A new area of textile research is a study of the relationships of fabric structure and finish to garment comfort and protection against pesticides. The object of this project is to determine how water and pesticide molecules penetrate and move through a fabric.

The Department of Home Economics Research will continue to emphasize basic research in nutrient metabolism and utilization and studies on nutrition-health relationships. Textile research will continue to be divided between basic research on textile properties and consumer-oriented research on consumer wants, needs, and expectations. Family resource management and rural family functioning may replace housing as the third area of research within the department. With changing family structures and an uncertain economy, research in these areas has been identified at the national level as having a high priority.

—Ruth L. Galbraith

Research with cotton pickers and strippers led to a major farming revolution in the 1950's.

AGRICULTURAL ENGINEERING

Agricultural engineering research in Alabama first started in 1914 at the urgent request of farmers attempting to raise crops in the wetter areas of Alabama. The Alabama Agricultural Experiment Station conducted a cooperative drainage project with USDA in Hale, Marion, Talladega, and Wilcox counties on private farms. These investigations continued until 1922.

The early 1920's also saw the first tractors introduced and used in Alabama. Farmers in the southern counties and Gulf Coast area had traction problems with their new tractors. In 1921, the Gulf Coast Citrus Growers Association requested the Alabama Agricultural Experiment Station to conduct research on traction with special consideration to the traction of Fordson tractors. The result was a grant from the Adams Fund (federal grant) for a project entitled "Fundamental Factors Influencing Traction of Wheel Tractors," which started in 1922. A rather extensive study in traction was conducted and results were reported to farmers and tractor manufacturers.

During 1922-27, land clearing and ditching for drainage research (using surplus explosives from World War I) was conducted in cooperation with the E.I. Dupont Company. During this same period, a rural electrification project was conducted in cooperation with the Alabama Power Company. Alabama Power provided a grant of $24,000 to study ways to effectively use electricity on the farm. Rural electrification studies in Alabama were some of the first conducted in the United States.

Innovative research, utilizing solar energy on the farmstead in conjunction with electrical use, was studied during the period of 1929-35. Adoption of solar energy use at that time was no doubt deferred because of low electricity costs.

Studies of research needs in the late 1920's by the Secretary of Agriculture led to an Experiment Station project on "Cotton Machinery Production" that was supported by USDA and started in 1930. This project provided for coordinated research with the Agricultural Experiment Stations in Georgia and Mississippi and was the first regional research project for agricultural engineering in Alabama.

Research commenced to determine fundamental requirements for crop production

Cooperative work between the Experiment Station and industry led to development of mechanical harvesting methods for peanuts.

machinery for producing cotton at a lower cost on the principal soils in the Southeastern States. These findings provided a basis for design of the equipment and its economical utilization.

As field studies progressed, many limitations were encountered. The need to build a laboratory having several soil bins, each with a different type of soil and large enough to allow operation of full size tillage tools with provisions for controlling the soil conditions, became evident. Efforts to establish such a laboratory were started in 1933 by the Alabama Agricultural Experiment Station. Communications with the United States Department of Agriculture and its Bureau of Agricultural Engineering in Washington led to funding and establishing of a laboratory in 1935, which is now known as the USDA National Tillage Machinery Laboratory.

During the late 1930's and early 1940's, research continued in tillage and traction, soil conservation, drainage, and electrification. During World War II, efforts were minimal due to a small faculty.

After World War II and into the 1950's, research and development of the peanut combine, in cooperation with industry, led to significant strides in mechanization of peanut harvesting. Companion studies in peanut drying and storage further contributed to farm mechanization in Alabama.

The early 1950's saw introduction of the first mechanical cotton picker in Alabama. Since that time, a continuous research effort has been underway resulting in development of effective machinery systems for growing and harvesting cotton. In 1962, the Marvyn Agricultural Engineering Research Unit was established to support cotton mechanization research work.

Production of poultry, with primary emphasis on broiler production, developed into a major industry in the State during the 1950's and 1960's and continues to be a leader in dollar value. Research conducted by engineers during the fifties and sixties resulted in appropriate structures which incorporated environmental control for housing.

In the 1970's, research efforts in trickle and sprinkler irrigation provided the base for today's irrigation of peanuts, pecans, and other crops. In a water-related area, a water blender was developed to enhance water quality in fresh water ponds for commercial catfish production. In the machinery area, the concept of controlled traffic and automatic guidance of farm tractors was developed. Studies were also conducted in the efficient use and management of farm machines. Some of the first work done in the United States focused on effective use of the large hay packaging machines which appeared commercially in the early 1970's. Research to utilize and manage animal waste also commenced.

The 1980's have seen the development of a variety of applied and basic research projects. Operational systems, using solar energy as well as biomass to provide 100 percent renewable energy sources for heating poultry houses, are being developed. Underway is the development of cost-efficient use of animal waste by-products for a stable on-farm energy source and feed component. Innovative techniques to better utilize energy, water, and land resources are being discovered. Experiment Station and USDA-NTML engineers have developed a concept of "custom prescribed tillage" as an approach to aid in the design and development of tillage equipment and control systems. Engineering design criteria is being developed to provide suitable traction and mobility for forestry harvesting equipment in the South while minimizing soil compaction and ecological damage to the forest. A research program is also being planned in the harvesting, post-harvest processing, and storage of agricultural commodities. These projects, most assuredly with the addition of many others, will be directed into the future.

—Paul Turnquist

COOPERATING AGENCIES

The federal-state partnership in agricultural research is exemplified by cooperative efforts between the Alabama Agricultural Experiment Station and various federal agencies. Many research contributions made at Auburn through the years have been the direct result of a team effort by researchers from the U.S. Department of Agriculture, U.S. Department of Interior, and the U.S. Department of Commerce working with Experiment Station faculty.

Current work in soil physics, cotton pathology, and cotton breeding by USDA, SWR-SEA, continues long-time cooperative work with the Department of Agronomy and Soils. Contributions of this USDA unit played a major role in development and release of Plains and Auburn 56 cotton varieties and in pioneering investigations in root growth.

Many breakthroughs in tillage and traction have come about through research at the USDA National Tillage Machinery Laboratory, which works cooperatively with the Department of Agricultural Engineering.

Wildlife and fisheries research of the Experiment Station has been extended greatly by cooperative programs with the U.S. Department of the Interior. The Cooperative Wildlife Research Unit has played a major role in Alabama's development into a "hunter's paradise," and fishing resources of the State have been improved through work of the Cooperative Fisheries Unit.

Forestry research in silviculture, physiology, and engineering has been greatly strengthened by the USDA Forest Service, through staff and facilities of the George W. Andrews Forest Sciences Laboratory on campus.

Development of the portable pen housing system to prevent parasite problems in young dairy calves represented a major contribution made by the USDA Regional Parasite Research Laboratory, which has worked cooperatively with Experiment Station animal science programs.

Alabama farmers are better able to cope with weather in agricultural production in recent years, thanks to a cooperative research program between the National Weather Service, U.S. Department of Commerce, and the Experiment Station.

Modern facilities of cooperating agencies significantly extend the total research program at Auburn. Among these are the USDA Regional Parasite Research Laboratory (above), USDA National Tillage Machinery Laboratory (top right), and George W. Andrews Forest Sciences Laboratory of U.S. Forest Service (bottom right).

AGRICULTURAL ECONOMICS AND RURAL SOCIOLOGY

Agricultural economics is a relatively young field, growing out of the application of business and economic principles to agriculture. It was not until the early 1900's that attention was paid to farm management and cost studies in the United States. Auburn's Department of Agricultural Economics was established in 1928, with research in agricultural economics, marketing and rural organization, and farm management becoming a part of the Alabama Agricultural Experiment Station's work.

First research in the department dealt with the relationship of cotton quality to prices received by farmers, economics of poultry production in Marshall County, and a study of farm organization in southeast Alabama with special reference to hog production. The cotton study found that the market for cotton was imperfect, with the price received by farmers for middling 7/8-in. cotton in six different Alabama towns on October 6, 1926, for 25-bale lots varying from 8.25¢ to 13.00¢ per pound. A recom-

The shift from single row, mule powered farming operations to the use of tractors as large as the one above, a change that began in the 1940's and has continued into the 1980's, could not have occurred without economic research to guide the transition.

mendation coming out of the study was for more exact use of grade and staple standards in marketing cotton.

The early poultry study pointed out the opportunity for small-scale farmers to increase the size of their business by a profitable poultry operation. Little did the researchers of the 1920's realize that the Alabama poultry industry would generate more than $700 million in cash receipts in 1981 to put Alabama in third place nationally as a poultry state. Research on egg marketing in 1924 revealed that grading of eggs was of little value without consumer education and that producers who had established direct marketing outlets received higher prices for their eggs.

The Great Depression resulted in overall poor economic conditions for farmers, with all-time low prices of 5.64¢ per pound for cotton and 43¢ per bushel for corn in 1931.

Agriculture in Alabama and the South began to change rather dramatically in the 1940's and 1950's, with adoption of hybrid seed corn and emphasis on better breeds of livestock. Agricultural economics research played an increased role in these agricultural adjustments. The potential for considerable improvement in farming and for increasing incomes to rural people became apparent through scientific farming. Research in agricultural economics therefore turned to evaluating farm adjustments from the standpoint of types and combinations of farm enterprises, volume or size of business, and wise use of farm credit.

Research administrators at Auburn realized there was a gap between small-plot research and the application of research findings in an actual farm situation. Therefore, experimental farm management units with various combinations of crop and livestock enterprises were established at the outlying research units. The latest research findings were applied in the organization and operation of these units. Meetings of farmers, bankers, and others were held on the substations to tour and discuss the production and financial success of these management units. They afforded an example for farmers to see firsthand how modern management principles and practices worked for potential use on their own farms. These units ably demonstrated the value of supplementing cash crops with livestock and poultry enterprises and provided the basis for transition from primarily crop farming to diversification with livestock and poultry enterprises.

At the same time emphasis was being given to management units research on substations, personnel in the Department of Agricultural Economics worked with bankers and credit agency personnel to provide them with an understanding of the adjustments that could and should be made in farming. Farm credit clinics in the State's major farming areas demonstrated to bankers the results of research and illustrated the potential pay-off from further investments in agriculture.

Passage of the Research and Marketing Act of 1946 gave considerable emphasis to marketing research. Surpluses had developed and one of the hopes for bettering the lot of farmers, as well as consumers, was through marketing research. Marketing research at Auburn dealt with cooperatives, livestock, milk, cotton, potatoes, eggs, new sweet potato products, and efficiency of marketing. Several studies were carried out to gain a better understanding of consumers and their decision-making processes in selecting and buying foods.

In 1965, the name of the department was changed to Agricultural Economics and Rural Sociology in recognition of the need for research on rural social problems and their relationship to agriculture.

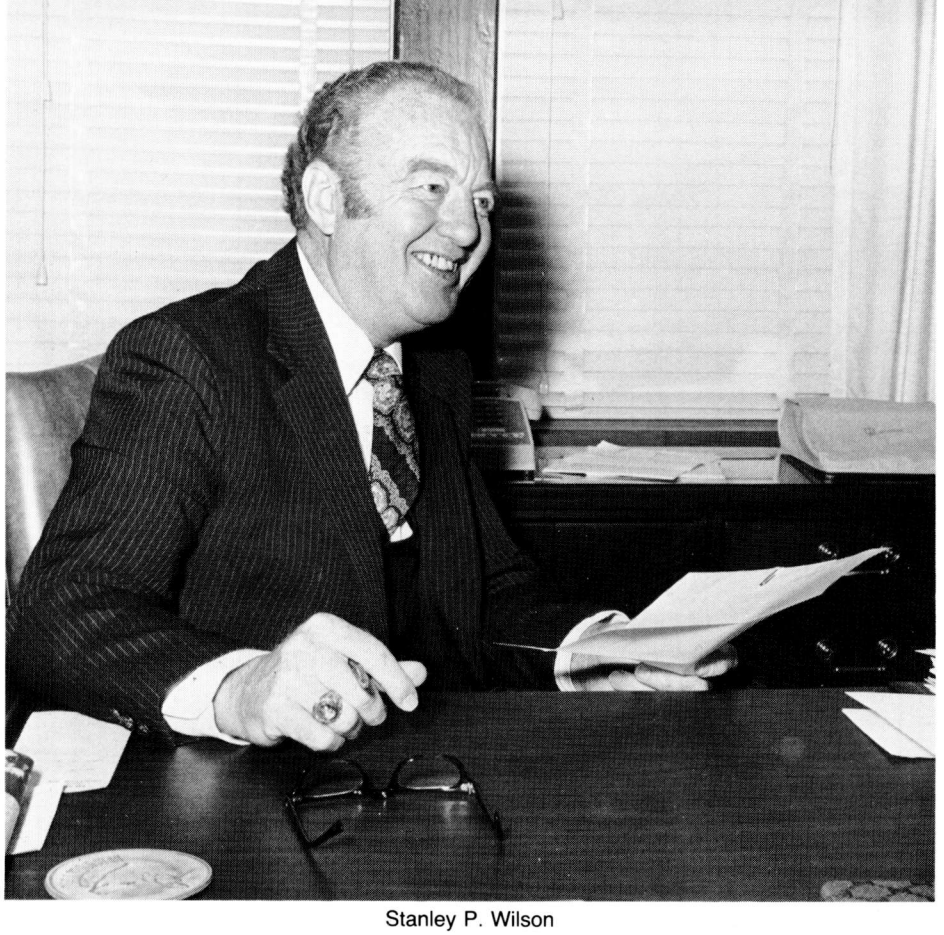
With a growing recognition of resource use and environmental problems in the 1960's and 1970's, research in the department was broadened. A survey of State parks and visitors, to evaluate Alabama's tourism potential in 1966, pointed out the inadequacies and lack of development of our State park system. With passage of the $43 million bond issue in 1967, Alabama launched a major program of park and recreational development. Personnel in the department did planning research that provided a sound basis for park and recreational development in the State.

The 1970's brought increased development and expansion of agriculture and agribusiness. Research in the department was adjusted to meet the modern-day needs of farmers and agribusiness for improved management based on sound business and economic principles. Research in marketing strategies, to include contracting and hedging, is underway to help producers do a better job of marketing. Farm management tools, such as budgeting, linear programming, and cash flow analysis, also are being studied, as are legal problems faced by farmers in buying and selling, owning real estate, and transferring property. Studies involving the attitudes of leaders and citizens toward developments such as the Tennessee-Tombigbee Waterway are providing useful information. Rural sociology research is helping rural youth define and achieve life goals as a part of the process of human resource development. Some research inputs are also being devoted to the economics of production and marketing of turfgrass, Christmas trees, catfish, ornamentals, and other commodities and foreign trade.

The 1980's, with their cost-price squeeze, high level of capital requirements, and vulnerability to price changes, call for increased emphasis on farm financial management for farmer survival in the 1980's. Auburn research must provide farmers and agribusiness personnel with research results that will make possible a continuation of increased productivity and efficiency in meeting domestic and world food needs. At the same time, scientific leadership is needed for achieving solutions and sound policies and programs in the areas of soil conservation and land use, water resources, and overall economic development.

—J.H. Yeager

Studies on consumer acceptance of Auburn-developed sweet potato products helped establish the market potential for new methods of processing farm products.



Stanley P. Wilson

The Future Beckons

I am delighted to be given the opportunity to speak to the readers of *Highlights of Agricultural Research* through the pages of this Centennial issue commemorating 100 years of service to Alabama agriculture and forestry by the Alabama Agricultural Experiment Station. Although the theme of this statement is to the future, please allow me to take a backward glance at our only essential industry—food and fiber production—which has progressed from the back-breaking hand labor of 100 years ago to the modern, high technology of today. Certainly a great deal of this progress can be credited to the establishment of our unique system of agricultural research and extension. This system has been supported since its inception by public funds, and, after a hundred years of this support, history shows very clearly that the early decisions were correct. For the expenditure of each dollar, the returns have been manyfold in the form of quality food for the American consumer at reasonable prices.

The American farmer has been in the past, and continues to be today, the most productive producer of food and fiber in the world. Because of this productivity and a variety of other reasons, from time to time we over-produce and find our bins full. At these times the cry is always heard, "Why continue research programs when we have more of everything than we need?" In answer, let me say first that we do not have an oversupply of food relative to world needs. The many countries that have the great food needs are generally poor and do not have the foreign exchange necessary to pay for this food, and the economic condition of the United States is certainly not such that we can provide that food free. Second, and more importantly, research cannot be turned on and turned off and the system remain effective. If we wait until society realizes the need for research, it is then too late to conduct that research. Research and extension programs have been the foundation upon which we have built our highly efficient agricultural and forestry industries. The efficiency of these programs has been proven over and over, and the need for research continues to escalate as the industries become more complex. America and Alabama have been richly rewarded by the Agricultural Experiment Station System.

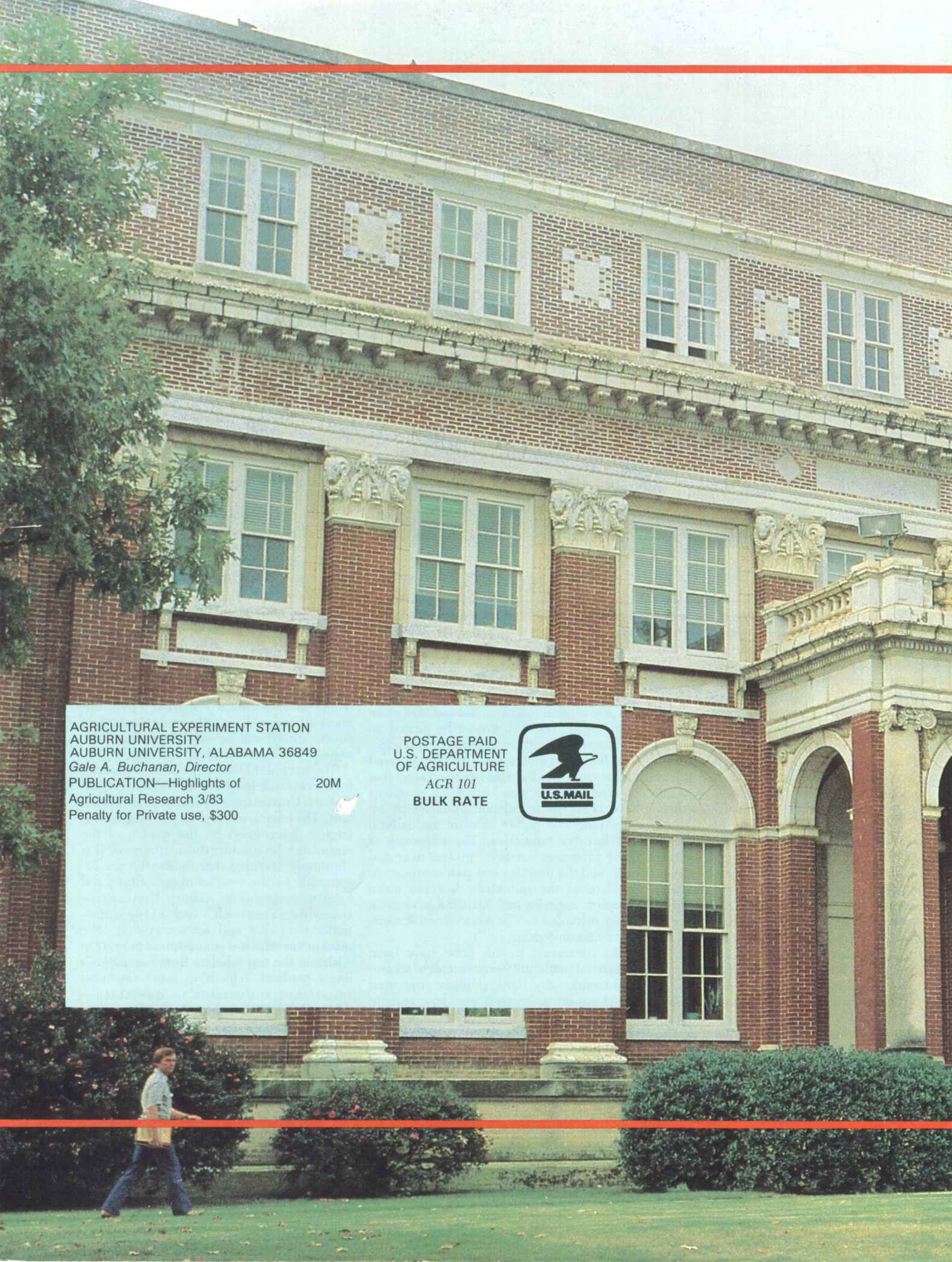
My comments to this point have been associated with previous research accomplishments, why these publicly supported programs are necessary, and how responsibilities have been fulfilled. Looking to the past can be self-fulfilling and gratifying, but it can also be a bit dangerous if we do not clearly understand that what is past is past. The present challenge is clearly to develop programs that are more effective in solving the problems of the future—problems which will surely be more difficult than those of the past.

As we look forward, we see continuing progress from our conventional research programs, but we also see marvelous opportunities associated with new areas of research, such as genetic engineering of plants and animals, conservation tillage systems, hormone therapy, adaptation of specific genetic combinations to unique environments, new concepts in protection of plants and animals from pests and diseases, and human nutrition, to mention a few. The frontiers are only as limited as the creativity and the imagination of the scientists conducting the programs. I have every confidence that those frontiers will expand far beyond our present capacity to visualize.

As an example of what may be possible in agricultural research, let us examine the concepts of genetic engineering. In the past, scientists have utilized mass selection and hybridization of plants and animals to make consistent but, in some cases, relatively slow progress. Certainly this very important progress will continue. However, much faster progress is possible if the new concepts of genetic engineering allow agricultural scientists to identify specific segments of genetic material and to manipulate them in such a way that they can be moved from individual to individual within a species and, more importantly, if desirable traits can be selected out and moved across species. If such genetic engineering is successful, it is not difficult to understand how this concept can very rapidly expand our knowledge base and provide important new information and biological material to our plant and animal producers. Genetic engineering is only one example of new and exciting future developments in agricultural research. There are many other equally worthy examples and, of course, there will be new discoveries that are not now even an idea.

The last point I wish to make in discussing future research in agriculture and forestry at Auburn University is by far the most important. The effectiveness of all our programs is largely determined by the quality of the scientists who conduct those programs. It is absolutely essential that those who are responsible for the conduct of agricultural and forestry programs at Auburn University—teaching, research, and extension—understand that and act accordingly. We must never relax our commitment to bring to Alabama the top scholars from our nation's finest graduate schools to serve the most important industries in our state—AGRICULTURE and FORESTRY.

Stanley P. Wilson
Vice President
Agriculture, Home Economics,
Veterinary Medicine



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